January, 1948

THE FOUNDRY

wherever metals are cast...

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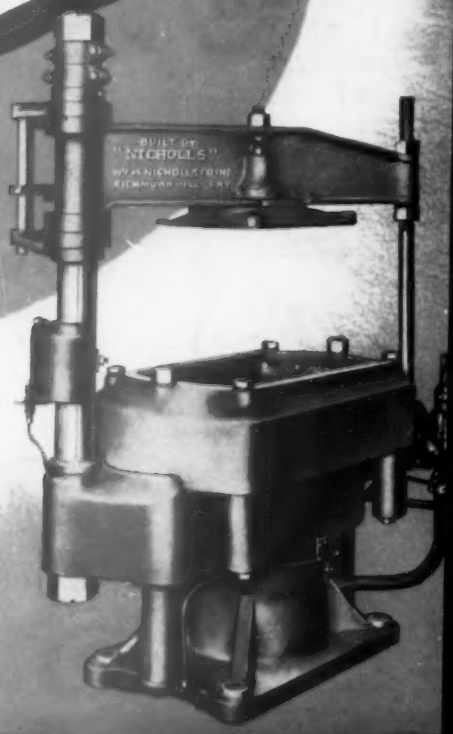
DETROIT

Heavy Duty Molding Machines by NICHOLLS



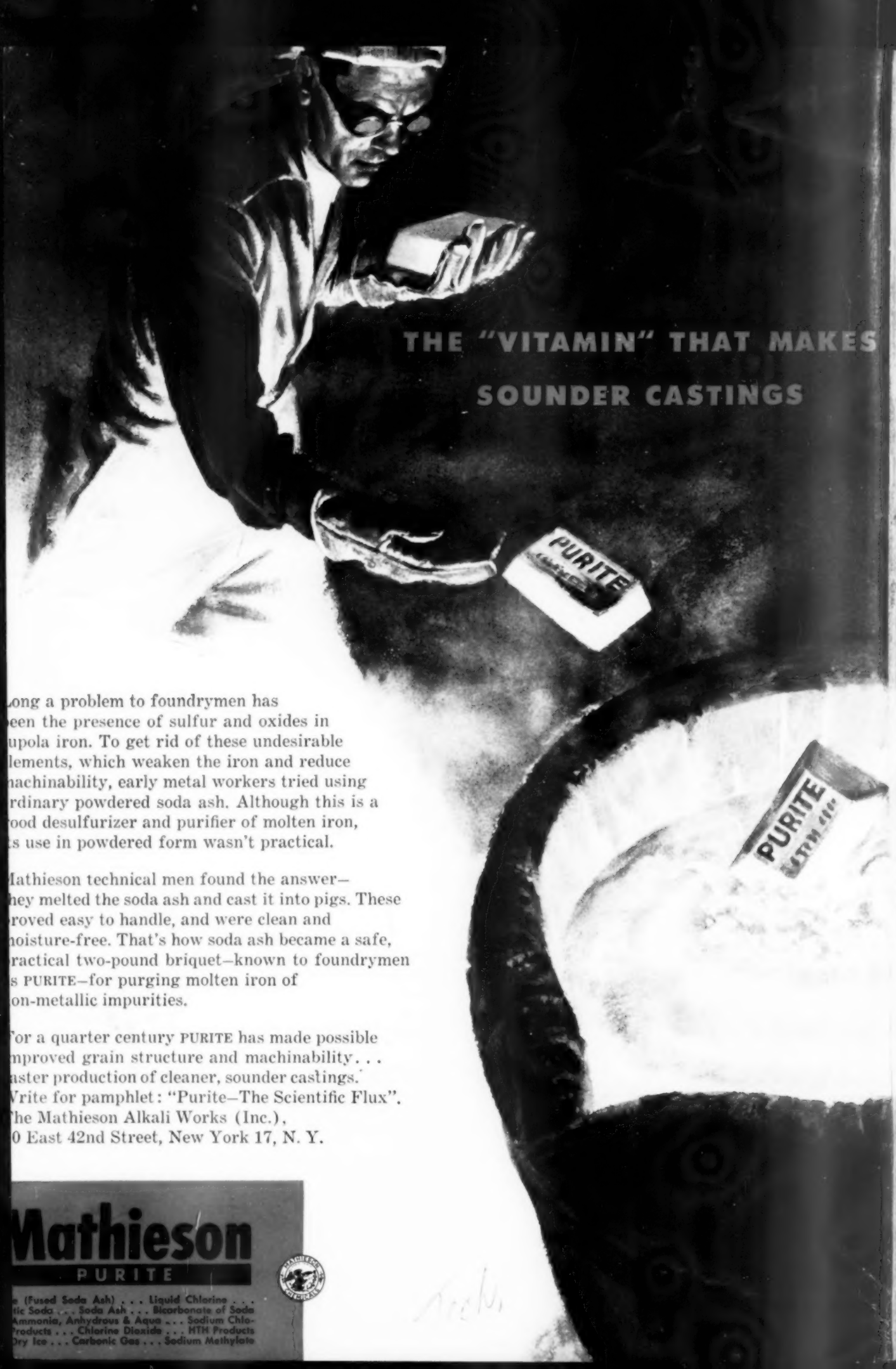
NOW IN THEIR 38th YEAR OF SERVICE TO THE FOUNDRY INDUSTRY

As we enter our 38th year of continuous service to the Foundry Industry, we are proud to be singled out as leaders in our field through war time emergency and peace time competitive advancement. Your past support inspires us to strengthen our efforts to maintain the leadership you have helped us achieve. NICHOLLS MOLDING MACHINES will continue to keep abreast of industrial changes and necessities in the future, as in the past.

WM. H. NICHOLLS CO., Inc.

RICHMOND HILL (18) · LONG ISLAND · NEW YORK

Foreign Manufacturers and Selling Agents—
For Continental Europe and Great Britain—The George Fischer Steel and Iron Works, Schaffhausen, Switzerland



THE "VITAMIN" THAT MAKES SOUNDER CASTINGS

Long a problem to foundrymen has been the presence of sulfur and oxides in cupola iron. To get rid of these undesirable elements, which weaken the iron and reduce machinability, early metal workers tried using ordinary powdered soda ash. Although this is a good desulfurizer and purifier of molten iron, its use in powdered form wasn't practical.

Mathieson technical men found the answer—they melted the soda ash and cast it into pigs. These proved easy to handle, and were clean and moisture-free. That's how soda ash became a safe, practical two-pound briquet—known to foundrymen as PURITE—for purging molten iron of non-metallic impurities.

For a quarter century PURITE has made possible improved grain structure and machinability . . . faster production of cleaner, sounder castings. Write for pamphlet: "Purite—The Scientific Flux". The Mathieson Alkali Works (Inc.), 60 East 42nd Street, New York 17, N. Y.

Mathieson

PURITE

Ash (Fused Soda Ash) . . . Liquid Chlorine . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua . . . Sodium Chlorate . . . Chlorine Products . . . Chlorine Dioxide . . . HTH Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Methylate

R v. 76 Jan.-June 1948

PURPLE STRAND Means "ALL THREE"

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When buying foundry rope, what's your first demand?

Strength?

Long life?

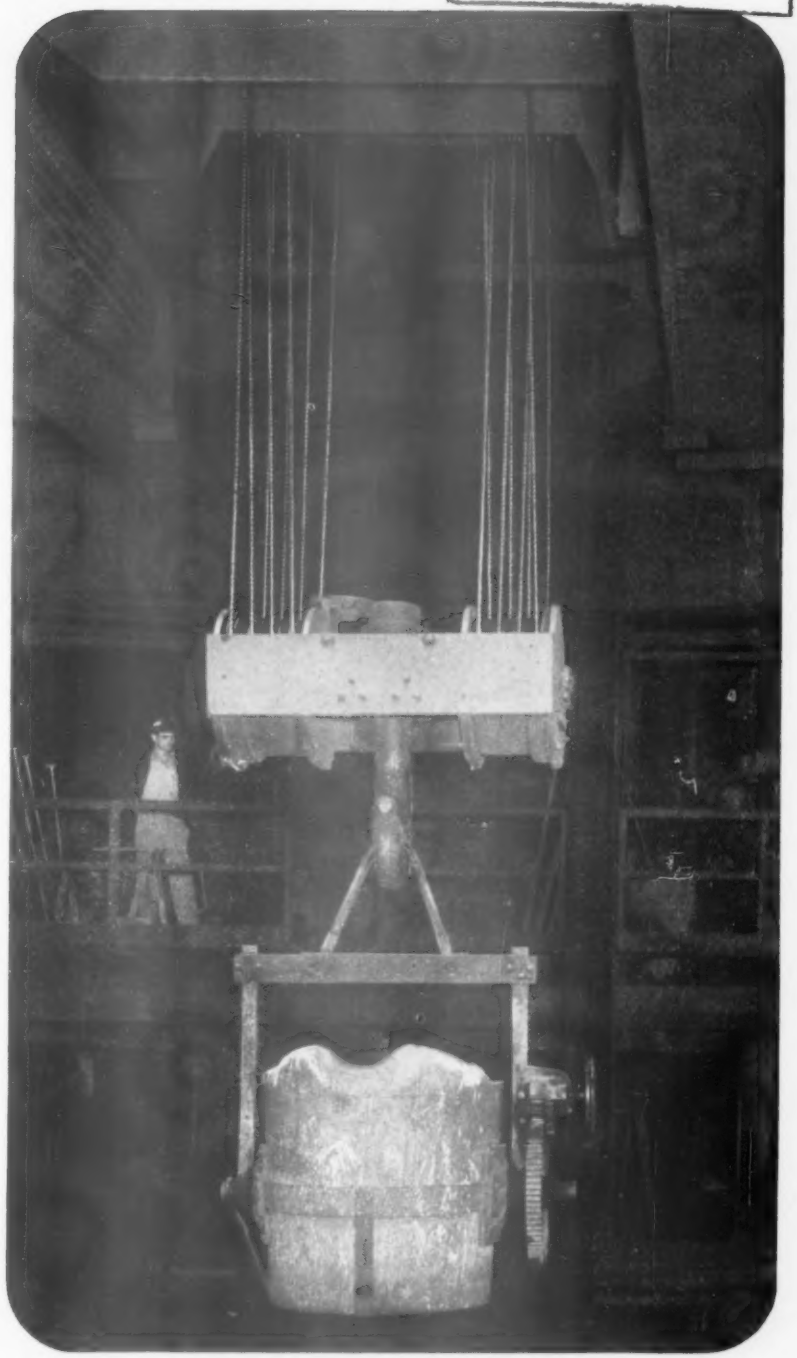
Dependability?

Actually, all three are "firsts." And you get all three in Bethlehem's Purple Strand—the quality wire rope for cranes, air and electric hoists, and other foundry applications.

Purple Strand is a trustworthy rope. Need more be said?

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation



When you think WIRE ROPE . . . think BETHLEHEM

Why reach for the moon?

THERE'S NO CLAY UP THERE, ANYWAY . . .
WHEN FOUNDRYMEN REACH FOR THE FINEST
CLAY BOND AVAILABLE, THEY REACH FOR

FEDERAL

GREEN BOND

GREEN BOND

Best of the Wyoming Bentonites

THE FEDERAL FOUNDRY SUPPLY COMPANY

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THE FOUNDRY

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JANUARY 1948

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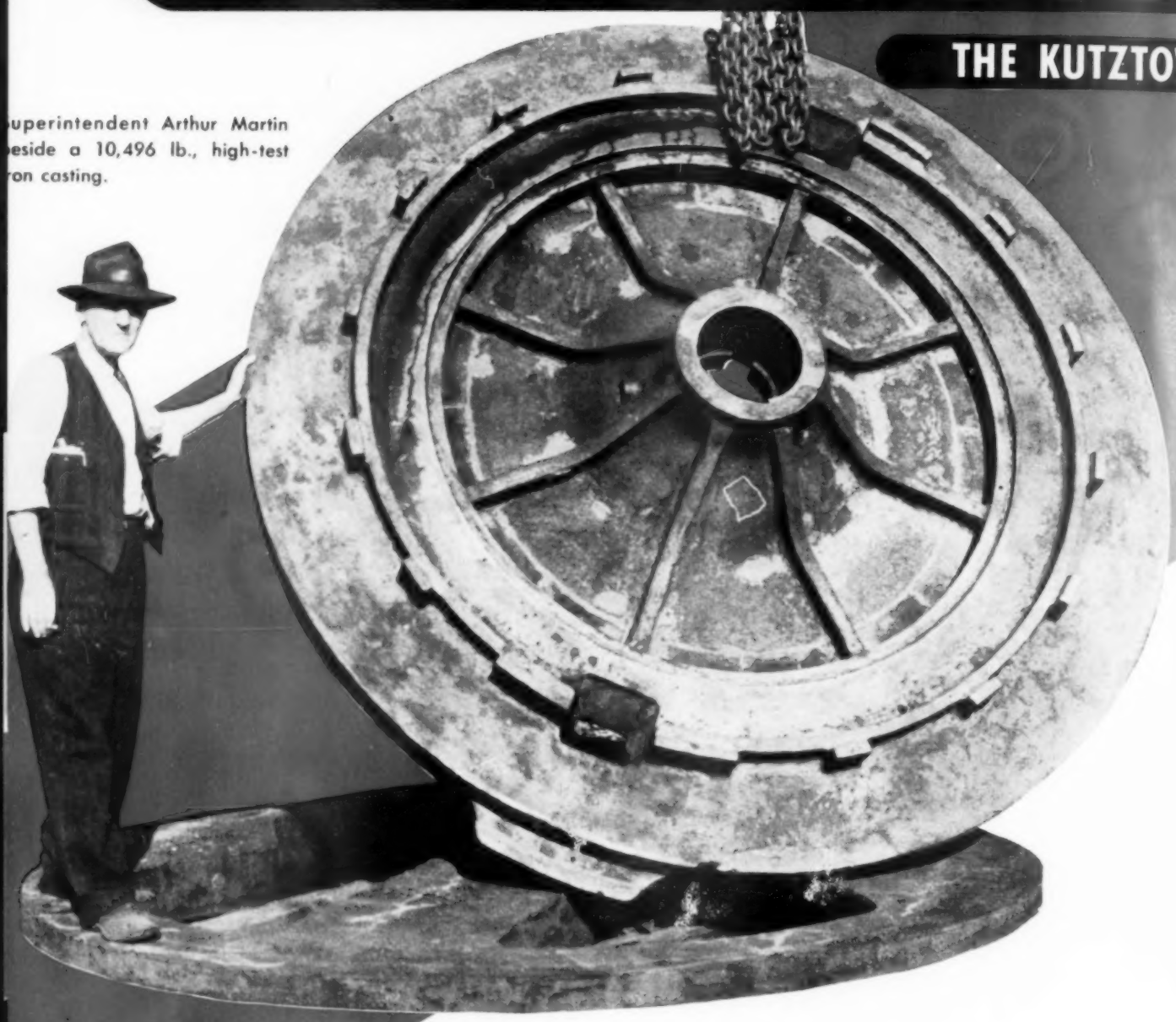
USE LINOIL TO

THE KUTZTOWN FOUNDRY & MACHINE CORPORATION



Superintendent Arthur Martin beside a 10,496 lb., high-test iron casting.

Any sound proposition that shows promise of effecting real savings in production costs deserves every foundryman's attention. To win acceptance it must actually prove definite savings and it must be fool-proof. For, in these times, costs are receiving extremely close analysis. And LINOIL is constantly proving its worth.

The Kutztown Foundry & Machine Corporation has been keenly interested in cutting costs. In their analysis, two facts convinced them of LINOIL'S value. To reduce high

LINOIL

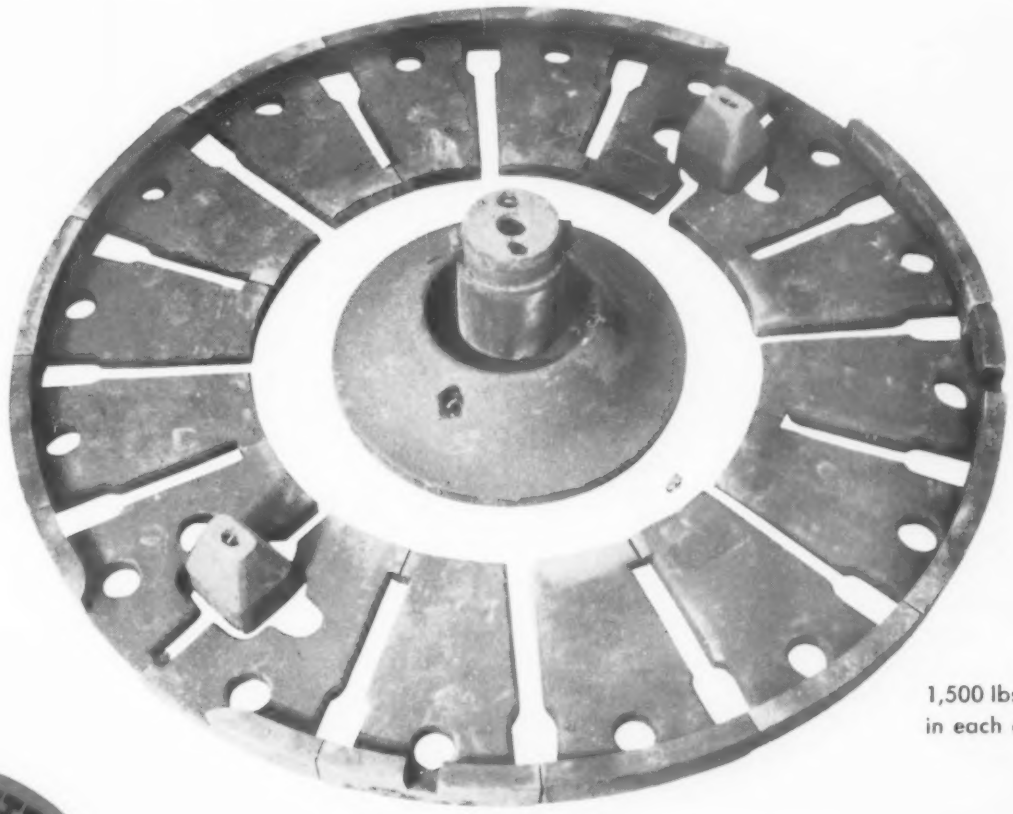
FIGHT RISING COSTS

OUNDRY & MACHINE CORPORATION • KUTZTOWN, PENNSYLVANI

cleaning costs, they adopted dry sand moulding. Their results proved well worth the change. For with LINOIL, they now clean big castings, like this intricately cored pulverizer plate, in a matter of minutes—eliminating former hours of expensive time and labor costs.

Secondly, a considerable investment in time, labor, and materials is tied up in one of their 5 ton castings. Naturally, they take every precaution to safeguard their work. Superintendent Arthur Martin considers LINOIL'S uniformity a dependable guarantee against casting loss from core failures. From long experience, Mr. Martin knows that uniformity is a money saver, and he insists on LINOIL because it never fails to meet his standards.

Not just a few, but thousands of foundrymen have discovered substantial savings by adopting LINOIL. Their results have been so favorable, that other foundrymen may find it equally profitable to carefully investigate LINOIL as one, reliable, method of reducing production costs.



1,500 lbs. of Linoil cores in each casting.

THE LINOIL THE LOGICAL OIL

WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

A MODERN ROTOBLAST TABLE DOES THE WORK OF 2½ TO 3 AIRBLAST TABLES OF COMPARABLE SIZE!

44-lb. pump housings (very dirty coming from the shake-out) cleaned at the rate of one ton per hour . . . master connecting rods cleaned at better than double the rate of barrel-cleaning . . . miscellaneous gray iron castings, varying from 10 to 75 lb., cleaned at the rate of 13 tons per 4 hours . . . castings for stoves cleaned at the rate of over 5000 lbs. an hour (more than could be handled by 23 tumbling mills) . . . those are some of the cost-cutting production rates being obtained with the modern Pangborn ROTOBLAST* Cleaning Table. In every case, too — quality of finish was improved!

*Trademark of the Pangborn Corporation

ROTOBLAST stream at 45° angle cleans tops and all sides as Auxiliary Work Tables revolve the work. This is Type LG. Type LF uses 90° angle, work passes through blast stream in fixed position.

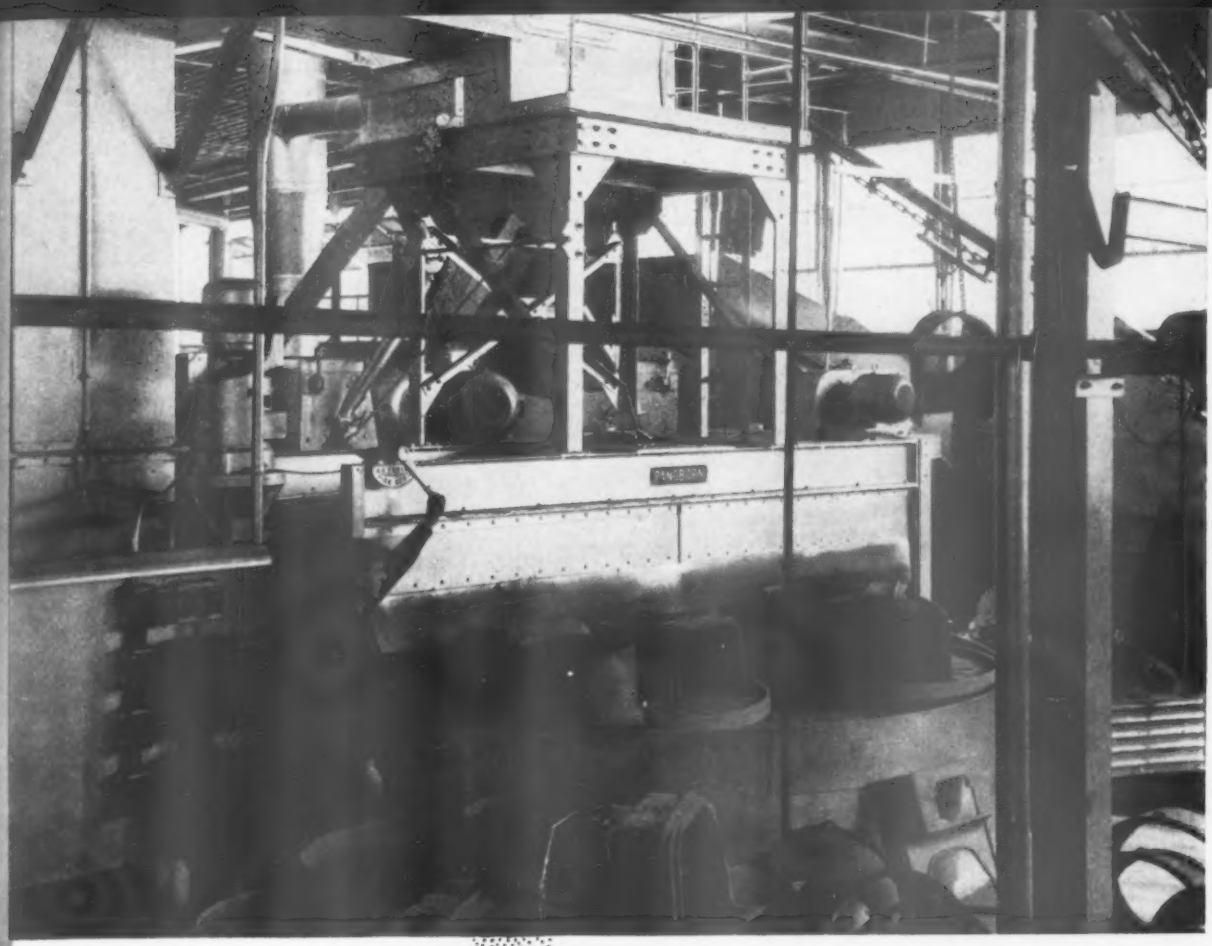
urning the tables

ON THE TREND OF CLEANING COSTS

Take a minute to consider just the *time* saved by the versatile Pangborn ROTOBLAST Table machine which uses metal abrasive and centrifugal force to do the cleaning. It takes the work as it comes — no waiting for batches of similar character. All exposed surfaces are offered directly to the abrasive stream — merely turning the work over for a second pass accomplishes the complete job. Loading and unloading are done while cleaning is in process.

Then add further advantages. Ability to handle fragile work or the general run of jobbing work. None of the breakage experienced with tumbling. Variable cleaning speeds. Work brought before operator's eyes — for inspection. Uniformly high quality of finish.

There are types and sizes of Pangborn ROTOBLAST Tables to cover all general needs including shot-peening — plus many jobs for which no other standard equipment is suitable. For new Bulletin No. 215, write Pangborn, *world's largest manufacturer of blast cleaning and dust control equipment*. Pangborn Corporation, 1400 Pangborn Boulevard, Hagerstown, Md.



LG Type Pangborn Table cleaning large castings at 40-50 tons per 7½-hr. day.

ROTOBLAST

BLAST CLEANS CHEAPER WITH THE RIGHT EQUIPMENT FOR EVERY JOB

Pangborn

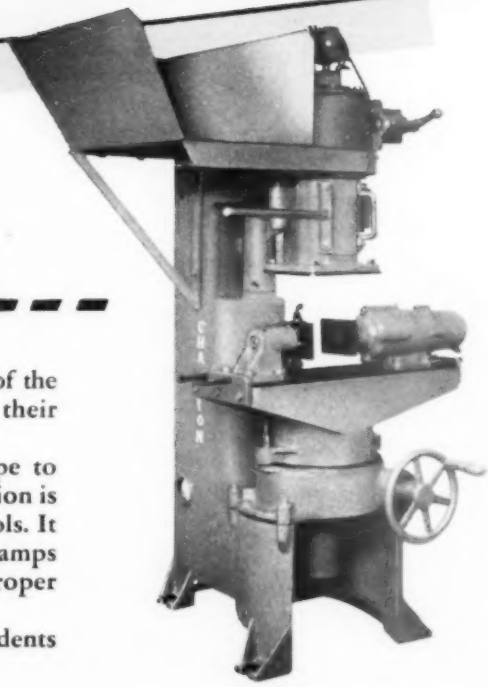
PANGBORN CORPORATION, HAGERSTOWN, MARYLAND

THE "CHAMPION METHOD"

MAKES IT *Easy* TO TURN OUT CORES

like these---

ON MACHINES *like this---*



This Champion Core Blower, the CB-10, though a smaller member of the Champion family, possesses all the features which give all Champions their outstanding speed, safety and precision.

Any type of core box can be used, and change-over from one type to another is simple and quick. The outstanding advantage of any Champion is the extreme simplicity of operation. A single lever provides all controls. It operates the core box clamp (when vertically split boxes are blown) clamps the core box to the blow plate and opens the blow valve, all in proper sequence, *and remarkably fast!*

Safety controls prevent improper operation, thus eliminating accidents and contributing materially to speed in operation.

Photos of castings and cores, and of Champion core blowers through courtesy of The Federal-Huber Company, Plano, Illinois

BY OPERATORS *like these---*

--and Fast!

Operators using Champion Core Blowers find their work easy to learn and pleasant to perform. All effort is supplied by the machine; the operator merely directs and controls it. Hence there is no fatigue to slow down production toward the end of the day.

Size of core has negligible effect on the speed of blowing, and Champions turn out such uniformly accurate pieces that even the largest sectional cores are assembled without jigging or grinding.

Champion engineering, based on a vast experience, has provided the strength, accuracy and simplicity of operation on every size Champion Core Blower, that makes them favorites with operator and management alike, in leading foundries the world over. The same skilled engineering is freely available for assisting you in working out the most efficient designs for core boxes and operating method, to suit your specific needs.

CHAMPION FOUNDRY AND MACHINE CO.
1318 W. 21st STREET CHICAGO 8, ILLINOIS

Check this . . .

IN YOUR FOUNDRY.

"the casting finish is no better than the mold and core surfaces over which the metal flows"

Send for bulletins describing Delta Core and Mold Washes and how to use them in your foundry.

If the mold and core surfaces are rough . . . the casting finish will be equally as rough. Smooth surfaces, having the required physical and chemical characteristics, produce finer-finish castings.

DELTA Core and Mold Washes, products of scientific research, produce slick-smooth mold and core surfaces which are highly refractory and non-reactive with molten metals. When applied to cores and molds they penetrate from 3 to 5 grains deep and, when dry, are thoroughly anchored to the sand surfaces.

Castings made with DELTA washed surfaces are cleaner, smoother and require only a minimum of cleaning room time.

For GREY IRON—Use DELTA GRAKOAT WASH

For MALLEABLE—Use DELTA HI-TEMP WASH

For NON-FERROUS—Use DELTA NON-FERRUSKOAT WASH

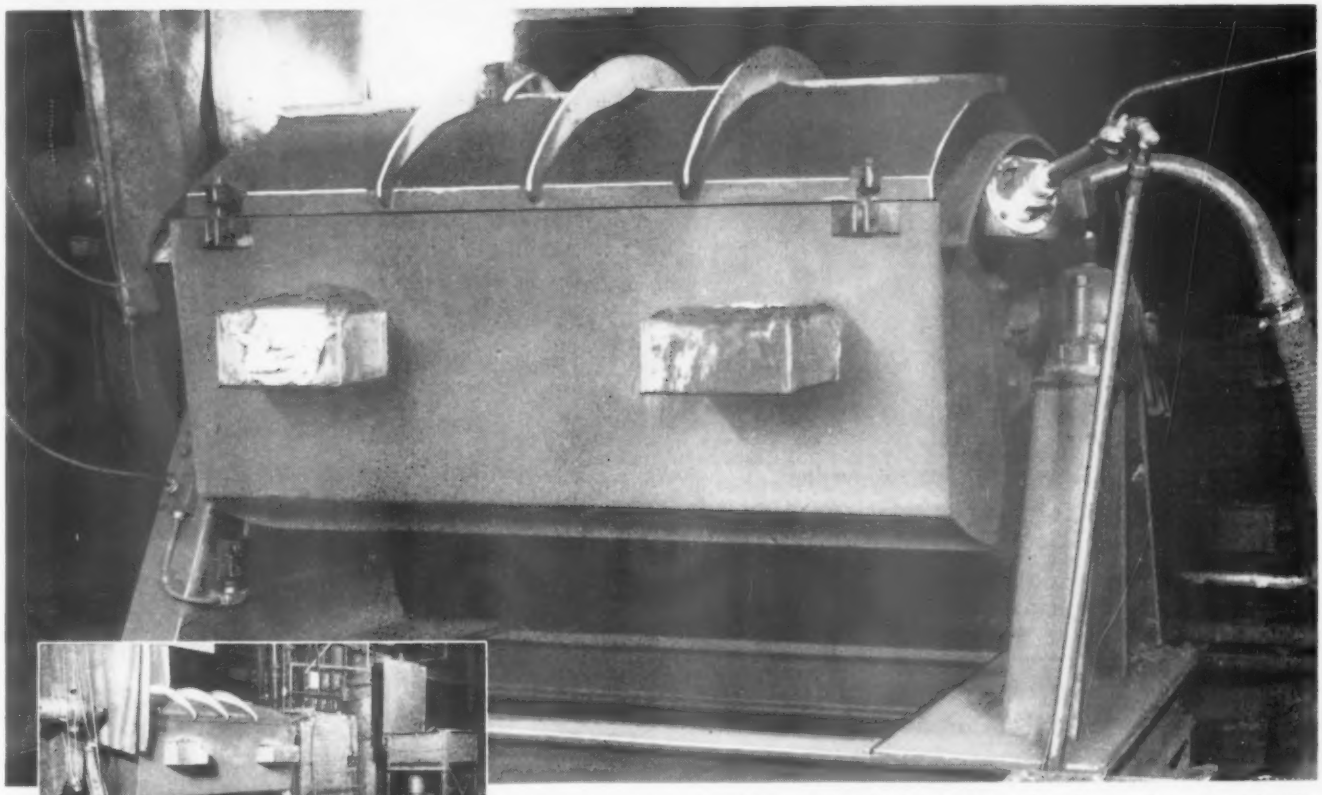
Ask for a liberal working sample for test purposes.

DELTA OIL PRODUCTS CO.

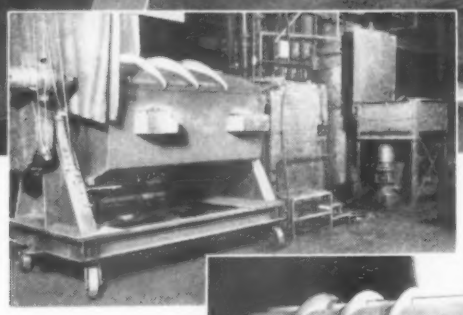
MILWAUKEE 9, WISCONSIN

New! Whiting 3-Ton Heated Metal Mixer

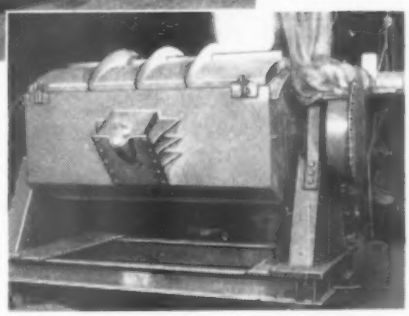
FIRED WITH PULVERIZED COAL



Close-up of 3-ton Whiting Heated Metal Mixer showing molten metal intake (right) and slagging spout (left). Larger units also available.



At extreme right is the coal feed hopper and Whiting #1 Pulverizer.



Front of the Heated Metal Mixer shows the pouring spout.

✔ A mixer for cupola metal that eliminates temperature loss

✔ Ideal when light, thin-sectioned castings are poured continuously

The new Whiting Heated Metal Mixer not only maintains cupola metal temperature, but may increase it slightly. It helps to hold composition uniform, and adjustments can be made in the Mixer if desired.

This new equipment is in effect a push-button operated tilting furnace fired with pulverized coal (or oil). Developed by Whiting—for over 60 years the pioneer of *better foundry equipment.*

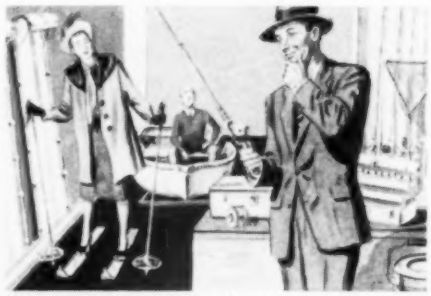
WHITING
CORPORATION

15607 Lathrop Avenue, Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N.Y.

Imagine a store with gifts like these...

aluminum luggage that gives strength and beauty . . . aluminum appliances that can't rust or corrode . . . aluminum furniture that moves with a touch



aluminum toys that are light but rugged . . . aluminum sports equipment that lasts for years

More and better aluminum products—*today*...with

Kaiser Aluminum

a Permanente Metals product

ACTUALLY, a large department store could be opened today which features *nothing but* aluminum products.

For all the products pictured above — plus hundreds *more* — are being made right now, offering more *comfort*, more *convenience*, more *beauty*.

Recognizing this, millions of people are *demanding* aluminum-made products, whether it be for building materials, household appliances, house trailers, garden tools, or what have you.

You, too, can demand—and *get*—these products. They're now being made in ever greater quantity because Permanente Metals, led by Henry J. Kaiser, is rushing to manufacturers the light, bright, lasting metal that makes them possible.

In but a single year of operation, Permanente Metals' huge processing plants produced 175 million pounds of plate, sheet, and strip aluminum . . . almost as much as the entire industry produced in the most productive year before the war!

That's why there are more and better aluminum products . . . today . . . with Kaiser Aluminum!

Get the Manufacturers' names

For the names of manufacturers nearest you who make the aluminum products pictured above, write:

Permanente Products Company

Consumer Service Division, 1924 Broadway, Oakland 12, California

More than 600 products are now being made of Kaiser Aluminum.

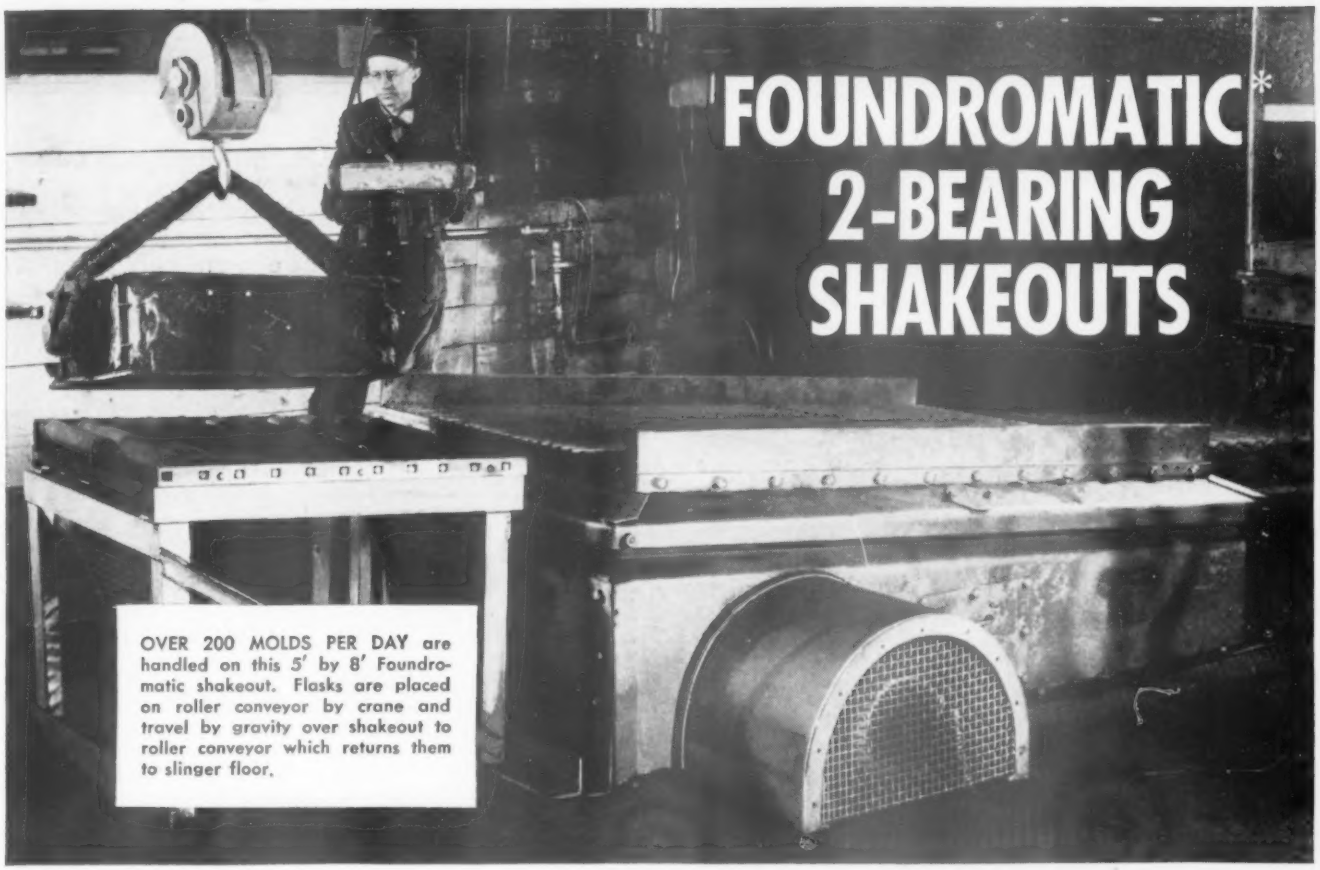
More than 1,000 manufacturers are using it.

Yet Kaiser Aluminum has been on the market for only 1½ years!

For a sample of the kind of action that brought us so far so fast, call any Permanente Products' office . . . and put us to work for *you!*

KAISER ALUMINUM IS SOLD BY PERMANENTE PRODUCTS COMPANY, KAISER BUILDING, OAKLAND, 12, CALIFORNIA—WITH OFFICES IN:
Seattle • Oakland • Los Angeles • Dallas • Wichita • Kansas City • St. Louis • Atlanta • Minneapolis • Milwaukee • Chicago • Cincinnati • Cleveland
Detroit • Boston • Buffalo • New York City • Philadelphia • Washington, D. C.

NOW... in Stock



OVER 200 MOLDS PER DAY are handled on this 5′ by 8′ Foundromatic shakeout. Flasks are placed on roller conveyor by crane and travel by gravity over shakeout to roller conveyor which returns them to slinger floor.

A NUMBER of Foundromatic 2-bearing shakeouts, complete with motors and drives are now available in the following sizes: 4′ by 6′ Capacity 4 tons—5′ by 8′ Capacity 7½ tons — 6′ by 8′ Capacity 18 tons — and 8′ by 10′ Capacity 25 tons. These rugged, heavy duty units increase production . . . reduce flask maintenance . . . improve foundry working conditions.

And you take no chances when you specify Allis-Chalmers . . . for all A-C foundry equipment was developed and tested in its *own* foundries . . . designed to do its job right, with a minimum of expense. Consult Allis-Chalmers now about mechanized equipment for *your* foundry. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

THESE 7 FOUNDROMATIC FEATURES GUARANTEE LONG, TROUBLE-FREE SERVICE

1. Body and shakeout deck are "all welded" . . . then stress relieved before machining for uniform strength.
2. Floating shakeout body is supported by resilient springs. No objectionable vibration can be transmitted to building.
3. Eccentric shaft produces effective vibratory motion. Castings and molds are freed in only a fraction of the time required with other methods.
4. Balance wheel and driven sheave are integrally constructed . . . no extra cost for sheave and flask breakage is minimized.
5. Entire weight of body and mold is carried by support springs. Bearings are required only to take care of centrifugal force of mechanism, resulting in longer bearing life.
6. Pivoted motor base maintains uniform V-belt tension . . . increases belt life.
7. No operating adjustments. Vibrating motion is positive and uniform up to maximum capacity. Large or small loads can be handled *without adjustment of any kind.*

SEND FOR NEW BULLETIN
07B6092A, "Foundry Mechanization" —for information on the entire Allis-Chalmers line of foundry equipment.

CUPOLA BLOWERS
All practical sizes. These units can be equipped with air weight control for better cupola economy. Request Bulletin 16B6048A.

COMPLETE A-C SCREEN LINE
includes *Low-Head, Aero-Vibe, Ripl-Flo* and *Utah* electric screens for every foundry screening job.

REGULEX* CONTROL
for arc furnaces makes possible lower cost melts by raising and lowering electrodes in response to changing furnace conditions.

*Allis-Chalmers Trademark

A 2321

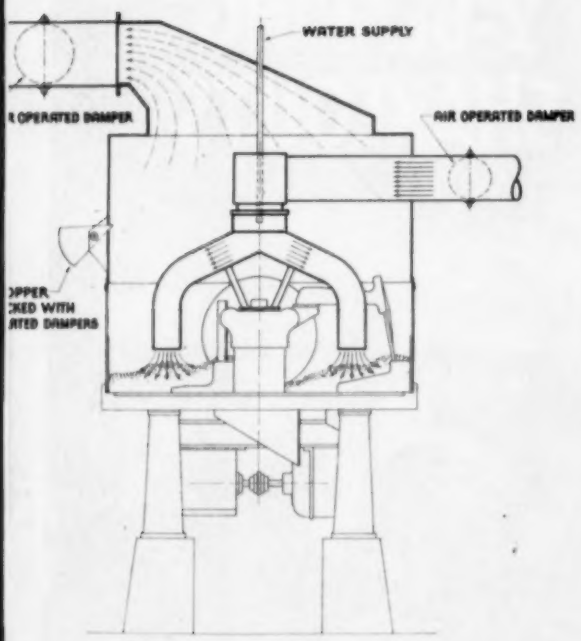
ALLIS·CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

A CENTURY OF SERVICE to Industry THAT MADE America Great

Problem { PROVIDE ADEQUATE COOLING OF HOT SAND TO IMPROVE MOLDABILITY AND REDUCE SCRAP

Solution { INSTALL NEW NATIONAL *ROTARY COOLING HOOD* ON EXISTING MIXER



THE letter reproduced on the opposite page tells, accurately and concisely, the real story of the kind of performance you can expect from the new National Rotary Cooling Hood. Installed on any standard Simpson Mixer, this new high-capacity cooler provides complete control of sand temperatures throughout mixing cycles, even under the most extreme sand temperature conditions . . . As evidenced by Mr. Seelbach's statement that "sand . . . as it comes from the Simpson Mixer . . . is very close to room temperature at the molding stations . . ."

Let a National Engineer show you how the new Rotary Cooling Hood will help solve your hot sand problems. Call or write for details today.

HERE'S HOW IT WORKS:

(Above) The basic principle employed in the new Rotary Cooler is the proved mechanical principle of cooling through evaporation. Excess moisture is added to the sand, and air at high velocity is forced through the sand as it passes over the plows. As the moisture is evaporated, the heat in the sand is transferred to the vapor generated, and carried out of the mixer. A slight vacuum is maintained in the mixer to prevent dust laden air from escaping into the work area.

(Right) Typical installation of two Simpson Intensive Mixers equipped with cooling hoods, installed at a large foundry.

Proof

THE
FOREST CITY FOUNDRIES Co.
Soft Light Gray Iron Castings

WALWORTH RUN PLANT

HIGH TEST SEMI STEEL CASTINGS

GENERAL OFFICES
2100 WEST 25TH STREET
CLEVELAND 13, OHIO

October 29, 1947

National Engineering Company
549 West Washington Boulevard
Chicago, Illinois

Attention: Mr. Fred Fuller

Gentlemen:

We wish to express our satisfaction in regard to your recent efforts toward improving a hot sand condition in our foundry.

As a re... we ... is now definitely cooler as ... eral ... Simpson Mixer, and is very close to room ... perature at the molding stations. It is now pos- ... ible to control our sand more closely, particularly in regard to the moisture content. Formerly, the high temperature of the sand, after mixing, resulted in evaporation and change in the moisture content after it had left the mixer.

We feel that your new rotary design cooling dev... is simple and practical and we would like to ... feature incorporated in the cooling ... with you for our new sa... mit.

...ly,

FOREST CITY FOUNDRIES CO.

Charles Seelbach, Jr

Charles F. Seelbach, Jr.
Plant Engineer

CFS:sn

MANUFACTURERS ASSOCIATION, INC. FOUNDRY EQUIPMENT

NATIONAL ENGINEERING COMPAN

608 MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

. . . a New York Skyline . . .

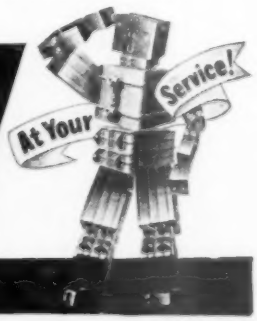
. . . in a Midwest Foundry

Space is at a premium in most foundries, just as it is in thickly populated Metropolitan areas. That's why stack molding with Sterling Steel Flasks is becoming increasingly popular. Molds are made in Sterling Flasks stacked one above another, to a height of 10 or 12 sections. Think what this means to the foundryman who has always had individual flasks sprawled over wide areas! Stack molding saves valuable floor space, yet increases foundry production 100% or more.

Sterling Special Rolled Steel Flasks are tailor-made for modern stack molding operations. Write today for further information.

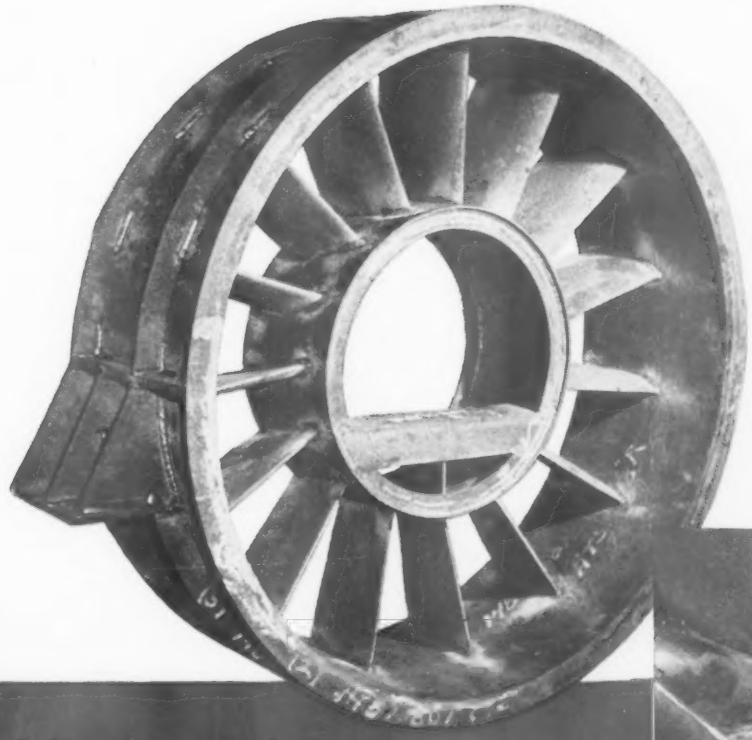
Pouring metal into stack molds made with Sterling Flask sections in a foundry employing the stack molding method.

Sterling FOUNDRY FLASKS



STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis., U.S.A.

A 5281-1P



Guide vane assembly of Jeffrey Aerodyne mine-ventilating unit. This consists of 15 cast iron vanes welded between inner and outer rings of heavy-gauge steel sheet with 5/32" Ni-Rod electrodes.

● ● ●

Close-up of guide vane assembly. Note smooth appearance of welds. One bead around each corner is all that is needed to bond a vane securely to the steel rings.

How welding cast iron to steel with NI-ROD SAVED 300 OPERATIONS PER ASSEMBLY

The Jeffrey Manufacturing Company, of Columbus, Ohio ... makers of Aerodyne Fan mine ventilating units ... were looking for a faster, simpler method of building their large guide vane sections.

The stumbling block was the fact that the 15 vanes are *iron castings*. The inner and outer rings between which they are mounted, are *steel sheet*. Although welding seemed like the obvious answer, cast iron-to-steel joints have usually been a crossed-fingers proposition.

After experimenting with several electrodes, Jeffrey engineers remained convinced that their standard fabrication method was the only way.

Here's what they had to do: Four slots had to be cast into each vane. In the thin sections between each pair of slots, they drilled two rivet holes. Then they had to cut out 60 pieces of strip steel, drill them, and rivet them into the slots.

Add that all up and it amounts to this: 60 holes drilled in the vanes, 60 pieces of steel cut to size, 120 more holes drilled in the steel strips, and 60 rivets to set. That makes 300 time- and labor-consuming jobs on each assembly, not to speak of a difficult casting job to put the slots in the vanes, and the final step, welding the steel strips to the rims.

And then came NI-ROD with the solution they were seeking.*

Ni-Rod quickly furnishes strong, sound deposits between the iron and steel. The smooth weld beads run all the way around each corner of each vane ... and are made without preheating.

* * *

On the basis of this experience, look over your own fabricating operations. Perhaps Ni-Rod can save you time and money in your production lines. You'll also find Ni-Rod great for general maintenance and repair work.

Ni-Rod comes in 3/32", 1/8", 5/32" and 3/16" diameters. Order a 5-lb. package from your nearest NI-ROD distributor. And, be sure to ask for a copy of the Ni-Rod Instruction Booklet.

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

NI-ROD IS DISTRIBUTED BY:

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1896 A PHILADEL

• Since the first convention of the American Foundrymen's Association was held in Philadelphia in 1896, that city has been the scene of foundry conventions in 1907, 1919, 1928 and 1934. Now again on May 3rd to 7th, 1948 the A. F. A. will hold one of its largest conventions and exhibitions in the city of its birth. Six times this ever growing group of foundrymen has returned to the scene of its first convention.

Located in one of the leading states in the production of cast metals, Philadelphia has proved to be a most enthusiastic and gracious host.

The coming convention in Philadelphia in 1948 will be "Old Home Week" for many foundrymen coming back to familiar surroundings once again to renew acquaintances, make new foundry friends and view the great exhibit.

It is not too early to make your plans to attend the 52nd Annual Convention next May. Check carefully the program of technical sessions so that you will be sure to attend those of greatest value to you. Improved foundry practice, improvements in equipment and up-to-date ideas will be the result.

THE FOUNDRY
CLEVELAND, OHIO
Since 1891 . . . Wherever Metals are Cast
—A PENTON PUBLICATION—

LPHIA STORY 1948

When the first issue of The FOUNDRY made its appearance in the fall of 1891, it was to fill the need of foundrymen for a magazine of their own. How well founded that idea was is borne out by the fact that The FOUNDRY has provided the only printed record of the achievements and progress of the cast metals industry down through the years. Today more than 35,000 readers of each issue constitute a glowing testimonial to the continuing service of The FOUNDRY to the foundry industry.

For many years The FOUNDRY has devoted two issues each year to special features concerning the A.F.A. Conventions and will do so again in 1948.

- THE MAY 1948 PRE-CONVENTION ISSUE will be the "Preview Issue". It will highlight the exhibit and the programs of activities for each day. In addition to all of the regular editorial features, this great issue will carry added features concerning the 1948 convention. Watch for it and read it thoroughly!

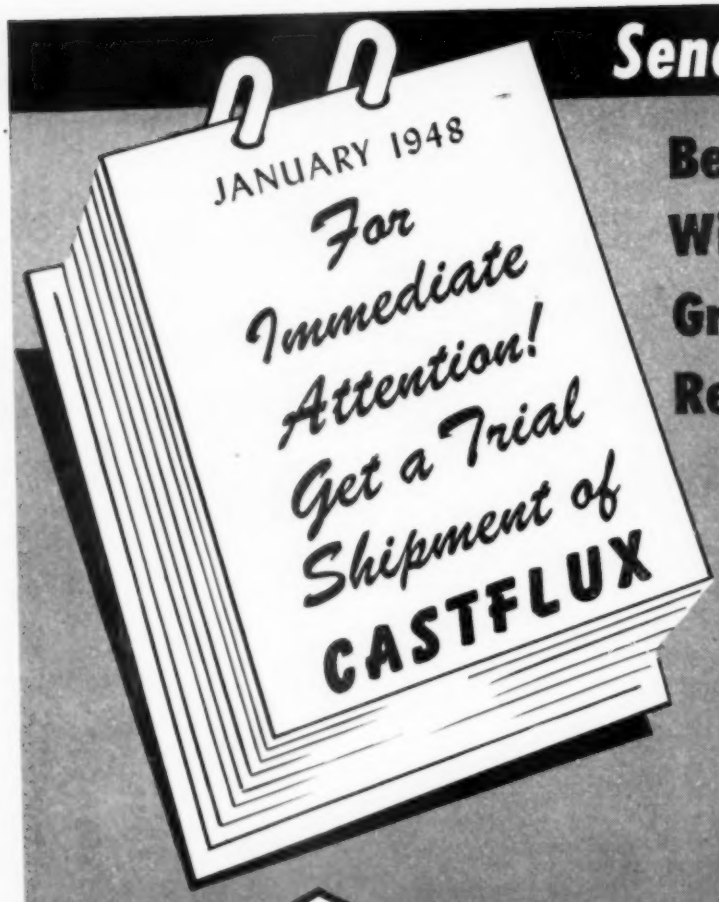
- THE JUNE 1948 POST-CONVENTION ISSUE will present the "story of the show"; a report of the technical sessions plus all the interesting and valuable material contained in every issue throughout the year. The 1948 Post-Convention Issue will make another valuable addition to your library of foundry literature.

To all foundrymen these two issues of The FOUNDRY will be of outstanding interest and to all who sell and serve the foundry industry, these issues present an important advertising opportunity.

May 3-4-5-6-7, 1948

Municipal Auditorium—Philadelphia

Send That Order Now!



Be Convinced That You Will Get Better, Closer-Grained Castings, Fewer Rejects, Less Miss Runs

at the Small Cost of

6¢ to 10¢ per ton

of Metal Treated!

What Castflux costs is insignificant compared to the overall savings effected by this remarkable scientific compound.

CASTFLUX TRADE MARK REG.

is the Dual Purpose Flux

BECAUSE

1. ON BOTH BLIND and OPEN RISERS . . .

it raises the temperature of the metal to a much higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.

2. IN THE LADLE . . .

Castflux cleanses and purifies the metal, bringing to the surface occluded oxides, gases, slag, dirt, and other foreign matter, offsetting the negative factors of inferior scrap and coke.

CASTFLUX *is sold on this* **UNCONDITIONAL GUARANTEE . . .**

Unless our representations are proven within 30 days after receipt of material, it can be returned at no expense to you.

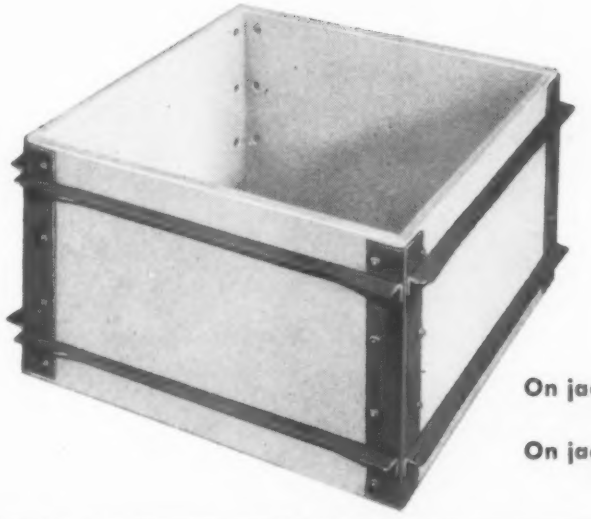
NATIONAL PIGMENT COMPANY

2115-2117 E. YORK ST., PHILA. 25, PA.

Sales Agencies Throughout the U. S. A. and Abroad

MOLTEN METAL *CAN'T* HURT 'EM!

NON-BURN
NON-WARP
SLIP JACKETS



ARE NOT AFFECTED BY RUNOUTS or SPILL-OVERS

CMD Slip Jackets won't stick; they fit smoothly and strip *clean* from the mold.

Heavy corner irons 2″ x 2″ x ⅛″ and cross reinforcing irons 1″ x 1″ x ⅛″ bolted and arc-welded in place prevent warping.

Write Today for Descriptive Circular!

On jackets up to 8″ deep, SINGLE angle irons are used.
On jackets over 8″ deep, DOUBLE angle irons are used.

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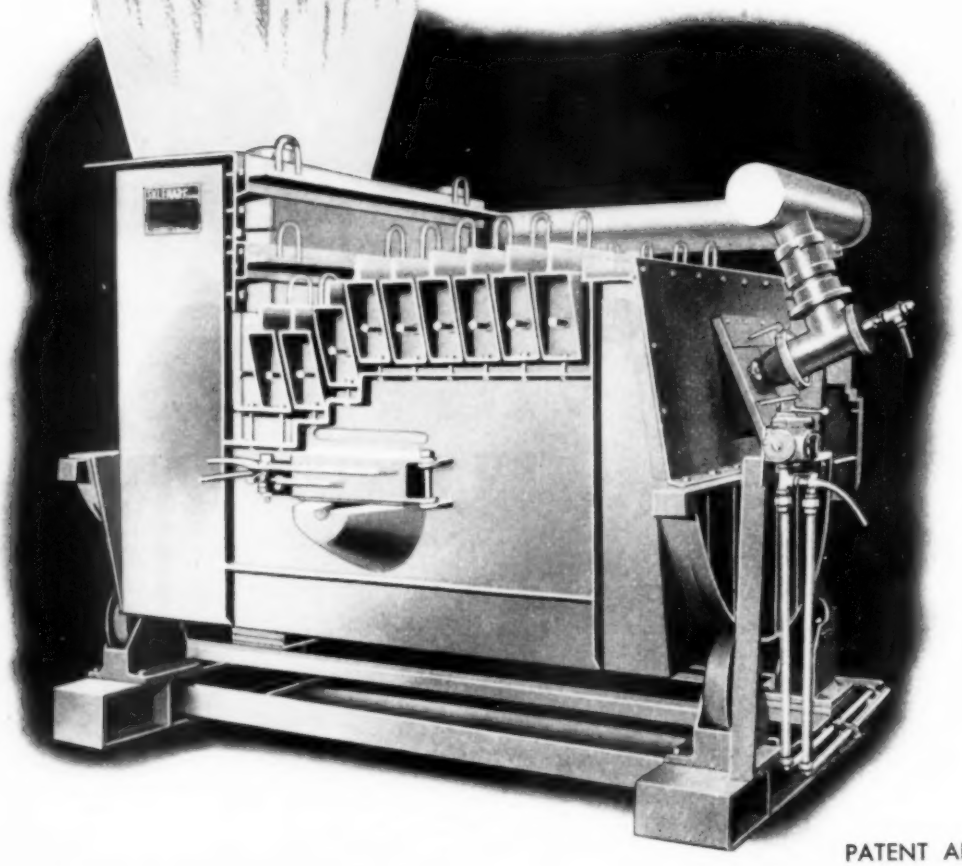
Dept. F, 1928 West 46th Street — Chicago 9, Illinois

THE NEW

Sklenar

IMPROVEDR



PATENT APPLIED FOR
AND PATENTS PENDING

SKLENAR FURNACE ANDM

WILSON INDUSTRIES, N

38 MEMORIAL DRIVE - - - - - - - C

EDREVERBERATORY FURNACE

Ranging in capacity from 350 to 20,000 lbs., this furnace has so many arguments in its favor that alert foundrymen owe it to themselves to check its amazing features. Here is a list of some of the things it does: (a) combustion has been improved beyond all expectation, lowering fuel consumption by 50%; (b) lining life is measurably increased; (c) flexibility control practically perfect; (d) reduces labor costs to a point where these savings are comfortably tangible; (e) melts metal rapidly and effectively; (f) more output with less space consuming equipment; (g) produces superior metal; (h) has lowest metal loss; (i) reduces maintenance costs to an amazing minimum; (j) perfect atmosphere control at all times; (k) melts all types of metal. Here, surely, are qualifications that should interest every foundryman who expects to melt metals at a profit.

The SKLENAR IMPROVED REVERBERATORY FURNACE is made in various sizes, ranging in capacity from 350 to 20,000 lbs., a size for every foundry. Capacities are rated for brass; for iron, three quarters of brass capacity; for aluminum, approximately one third. The SKLENAR REVERBERATORY FURNACE is really revolutionary. Gases pass through the furnace at a predetermined speed, preheating metal in the hoppers which is actually melted in suspension. Metal flows into combustion chamber and is brought up to temperature by the perfect combustion that obtains in this—AND ONLY IN THIS—type of furnace. Today its use in plants throughout this country and the rest of the world speaks for its wide acceptance. This development of an improved version of SKLENAR'S well known reverberatory melting furnace was brought about by the inventor. Mr. W. F. Sklenar, F.F. Sc., M.E., was always interested in the best possible melting practices, and up to this time, in the opinion of men who profitably operate these furnaces, the best possible melting is done in the SKLENAR IMPROVED REVERBERATORY MELTING FURNACE.

DMANUFACTURING COMPANY

S, INCORPORATED ***Sole Distributors***

--CAMBRIDGE 42, MASS.

SAND TESTING IMPROVES
The FOUNDRY BALANCE SHEET

When you install a consistent sand testing program, you may expect a very real improvement in the appearance of your profit and loss statement for five definite reasons.

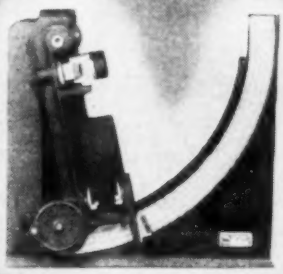
1. You reduce your scrap losses.
2. You can use molders who are less highly skilled.
3. You automatically improve casting finish.
4. You eliminate any disagreement on methods of procedure.
5. When trouble does develop, you can spot the cause much more quickly and get it corrected sooner.

This isn't just beautiful theory. It has been done many times. It is being done today in many foundries. It really works and it might just as well work for you, too.

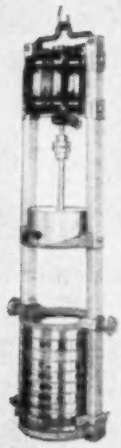
The cost of putting a SAND CONTROL program in your foundry will not be prohibitive by any means and it is quite possible that you will be surprised at the small cost involved.

MOISTURE CONTROL

PERMEABILITY CONTROL



STRENGTH CONTROL



FINENESS CONTROL

MOLD HARDNESS CONTROL

SAND SCHOOL

Have your sand technician attend our sand control school for three days. All instructions in sand testing and in sand control. There are no charges for this service. Write us for appointment.

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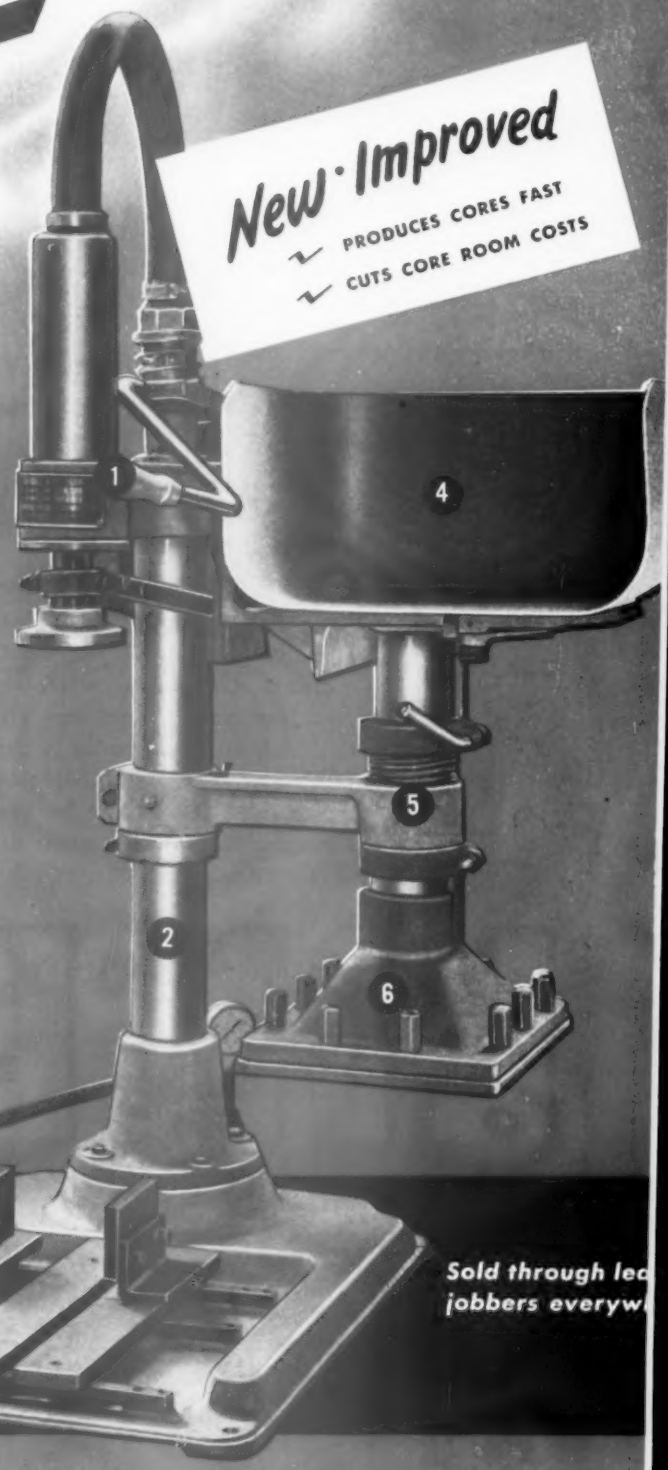
SAND · MOLD · MOISTURE · SULFUR · CARBON

Randall CORE BLOWER

"DESIGNED TO PRODUCE"

New · Improved

- PRODUCES CORES FAST
- CUTS CORE ROOM COSTS



This new and improved Randall Core Blower puts small core runs on a production basis. You can really produce with this bench model machine.

Equally important, you can Blow 'Em as You Need 'Em . . . eliminating a large stock of cores in the core room . . . a great saving in this feature alone.

See your jobber and ask him for a demonstration or write direct to us.

THE RANDALL FOUNDRY EQUIPMENT CORPORATION

Newburgh Station, Cleveland 5, Ohio

1. Simultaneous Blowing and Clamping—One Lever.
2. Rear Column serves as Air Reservoir.
3. "Randall Snap-action" Toggle Side Clamp for Vertical Boxes.
4. Sand Hopper.
5. Swing-type Blow Head Permits Quick Filling. Reduces Operator Fatigue.
6. Blow Head can be Turned to Any Angle. Blow Plate has 9½" by 7" Blowing Surface.

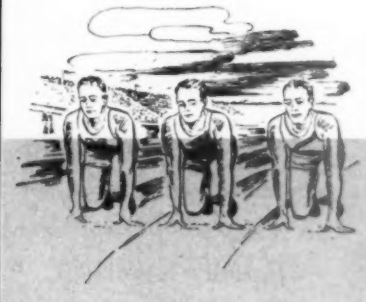
Operators like the Randall because they can blow several boxes with one filling of the sand magazine. The Randall reduces operator fatigue and ups production.

Sold through lea jobbers everywh

THE Randall CORE BLOWER

"DESIGNED TO PRODUCE"

CLEAN = STRONG = FAST



THERE are three musts for a top flight core oil. It must be clean to work with—clean enough to meet production schedules and clean for the core blowing machines. It must be strong enough to do a tight job of bonding—it must be tough rather than brittle and carry a high plus beyond the strength just needed. It must be fast to bake in a normal oven—it must be responsive when time and temperatures are accurately controlled and be fast to reach top strength.

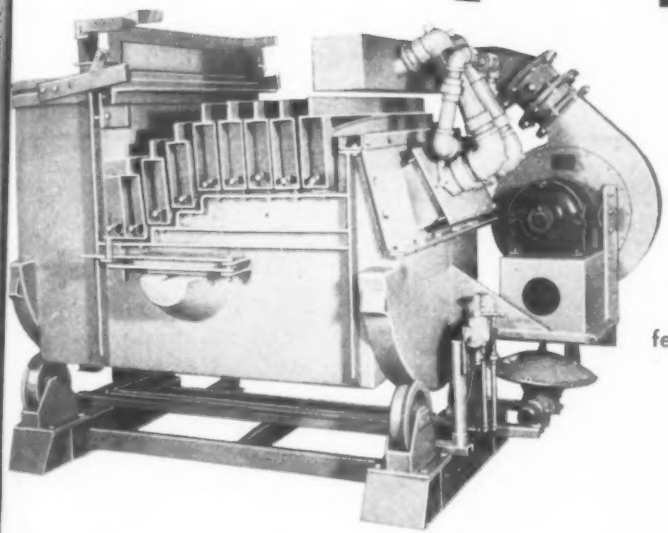
LINBOND

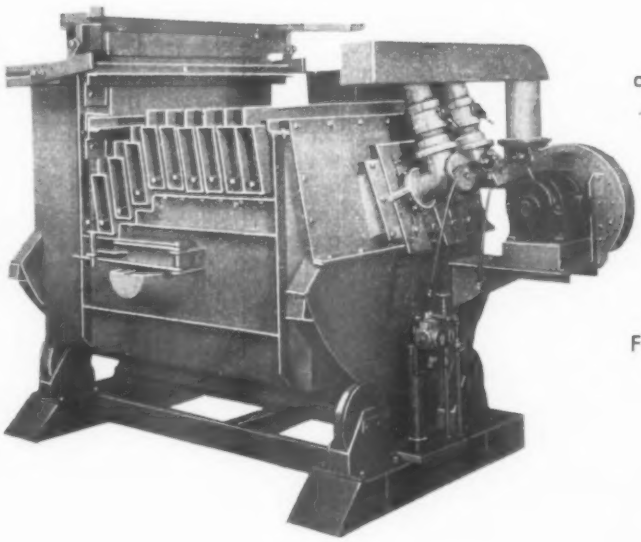
is just such an oil. It is offered in several grades to meet individual foundry needs. All are on the bright side for color and any fumes that may be given off are not the hard-to-take kind. Linbond is the sort of oil foundries like to tie up to. You can get a sample large enough to make up five or six hundred pounds of sand by writing to

UNITED OIL MFG. COMPANY

1429 WALNUT ST., ERIE, PENN'A.

INTRODUCING STROMAN Economelt FURNACES





Stroman Economelt Furnaces are without a doubt the last word in Direct Fired, Reverberatory Type Furnaces. Designed to give utmost efficiency in the melting of Grey Iron, Brass, Bronze, Aluminum or Ferro-Manganese and other ferrous alloys, they do any given task of metal melting better, faster, more economical and at tremendous savings in costs.

They are ideal for use in Die Casting or Permanent Mold Plants as well as any type foundry . . . as their design for pre-heating metal before it reaches the molten bath makes them the nearest thing to a continuous pour furnace available. The direct fire does not injure the metal, and cuts melting time to surprisingly new lows. Handling capacities (brass) from 400 to 2,500 lbs. they assure correct sizes for any desired melting job. Fired by either Gas or Oil they are delivered complete, ready for operation. For the most modern in non-ferrous metal melting furnaces, contact Stroman. These Economelt Furnaces are just another Stroman "First" . . . investigate their possibilities in your plant at once.

WRITE FOR BULLETIN No. 635 – *today*

STROMAN FURNACE & ENGINEERING CO

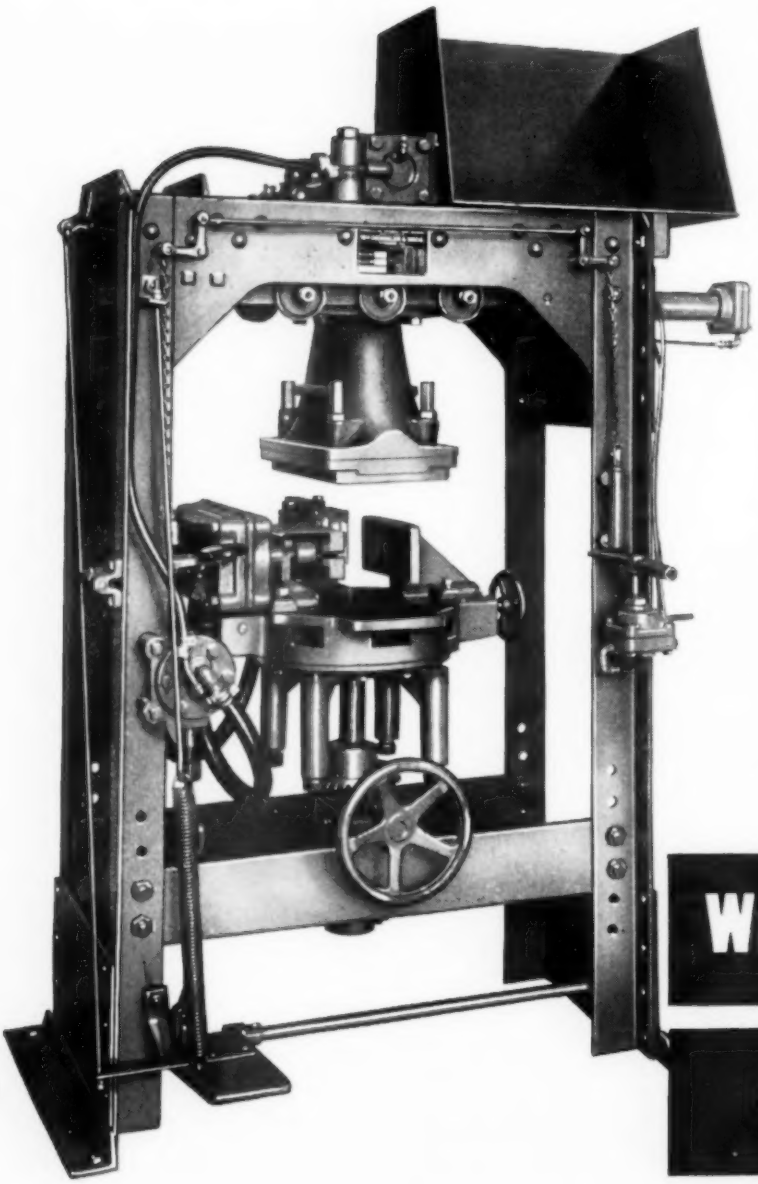
DIVISION OF

THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO

VERSATILE!

The No. 1 Demmler

General Purpose Core Blowing Machine



The DEMMLER No. 1 general purpose Core Blower is a popular machine because it is a profitable machine to own.

Its versatility in blowing both small and medium size quality cores at a high rate of speed with maximum economy, coupled with its modest price and rugged dependability, has made it the leader in its field.

The machine is built on a rugged structural steel frame, has a productive capacity of about 200 core boxes per hour and is available with several different sizes of sand magazines. Job changes in from five to ten minutes are easy because hand wheels quickly raise and lower the chuck table and make the proper chuck jaw adjustments. The clamping, blowing and releasing operations are performed in less than four seconds.

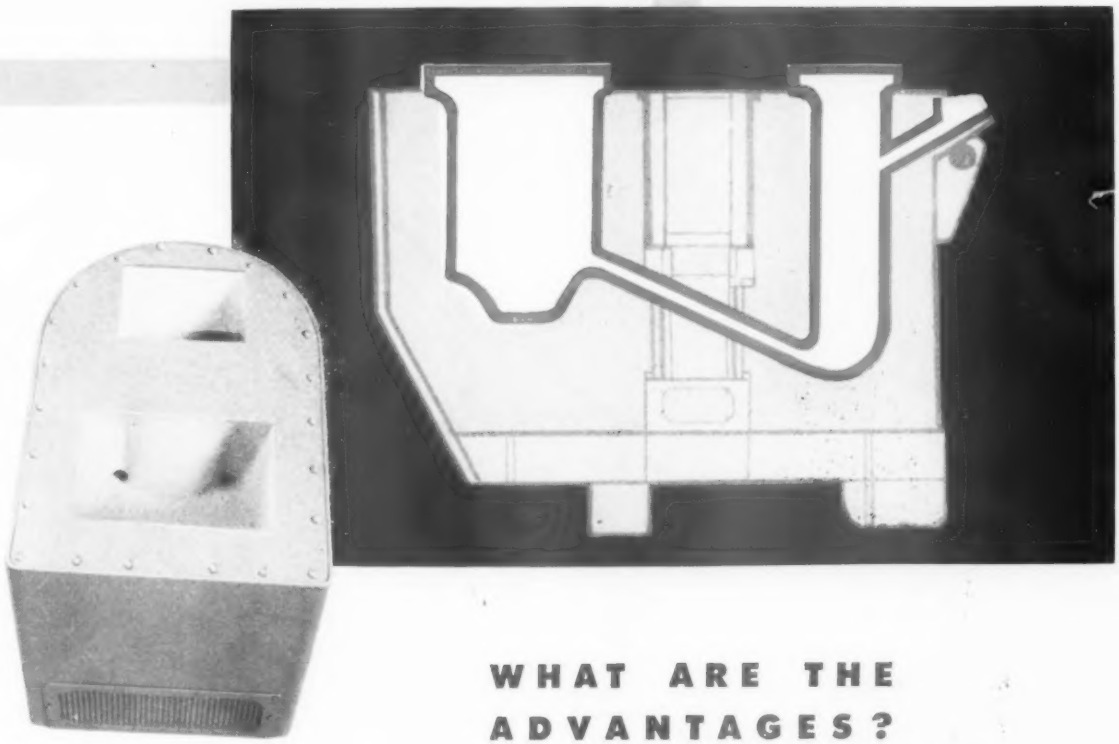
For general-purpose small and medium core blowing work, choose the DEMMLER No. 1—the core blower with an unchallenged reputation for dependable, profitable performance.

WRITE FOR ILLUSTRATED FOLDER TODAY!

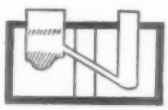
Wm. Demmler & Bros.

KEWANEE, ILLINOIS

Why Two Chambers in the LINDBERG–Fisher INDUCTION MELTING FURNACE



WHAT ARE THE ADVANTAGES?



Cleaner molten metal. Residue remains in charging chamber—either floating at surface or sinking to bottom. Only clean, residue-free metal passes to second chamber for pouring.

Metal always at pouring temperature. Adding cold metal to charging chamber does not affect temperature in pouring chamber, within reasonable operating limits.

Less scrap loss. Set furnace for a lower maximum casting temperature. Plus or minus 5° F. temperature control eliminates possibility of over- and undershooting.

Easier cleaning. Pouring chamber seldom requires cleaning as only residue-free metal reaches it. Straightline melting channels clean easily.

Less maintenance. Refractory-lined chambers—no crucibles or pots to replace. No burners to clean.

Cooler operation. Induction heating heats metal only, not the entire furnace. Covered chambers prevent heat radiation except when charging or ladling.

Now . . . a complete line of melting furnaces—gas, oil, electric

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2453 WEST HUBBARD STREET • CHICAGO 12, ILLINOIS

GAS.. PRODUCTION-LINE FUEL

Homestead Lever-Seald Valve—for handling fluids at high pressures and temperatures—one of the multitude of Homestead Valves for all types of applications.

Gas-fired "SKLENAR" Furnace for high-speed melting of ferrous metals.

Sectional Gas-fired core-drying oven.

for

FOUNDRY MODERNIZATION

Foundry modernization is a continuing project at Homestead Valve Manufacturing Company, Inc., Coraopolis, Pa., because Homestead engineers have since 1892 kept their sights set on modern productioneering equipment and methods.

And, in their research, these engineers have investigated fuels and combustion techniques as they apply to foundry practice. As a result the productive flames of GAS are increasingly important and more extensively used in Homestead's production lines.

Modern Gas-fired Foundry Equipment, such as the "SKLENAR" furnaces for ferrous metal-melting, utilize the special characteristics of GAS—flexibility, controllability, speed. This saves equipment space, melting time, and lining maintenance. Operating at 2700° F. these furnaces have a capacity of one ton heat per hour, and 160 heats per lining—evidence that modern Gas Equipment is really productioneering equipment.

But this is not the only GAS application in the manufacture of Homestead valves. Core ovens, annealing furnaces, and non-ferrous crucible furnaces are all heated by the productive flames of GAS. If you haven't investigated modern Gas-fired Foundry Equipment recently, your local Gas Company Representative will bring you up to date.

AMERICAN GAS ASSOCIATION
420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

MORE AND MORE...
THE TREND IS TO GAS
FOR ALL INDUSTRIAL HEATING

For a COMPLETE LINE OF NON-FERROUS METALS—COPPER BASE ALLOYS, ALUMINUM ALLOYS, MAGNESIUM ALLOYS, COPPER-NICKEL ALLOYS, ZINC BASE ALLOYS, DEOXIDIZERS AND HARDENERS . . . for the answers to puzzling foundry problems . . . for fast deliveries and friendly service . . . call the nearest Federated office.

All of Federated's 25 sales offices and 11 plants are linked . . . joined . . . in a common purpose — to bring you the advantages of the uniformly good facilities which this huge organization maintains.

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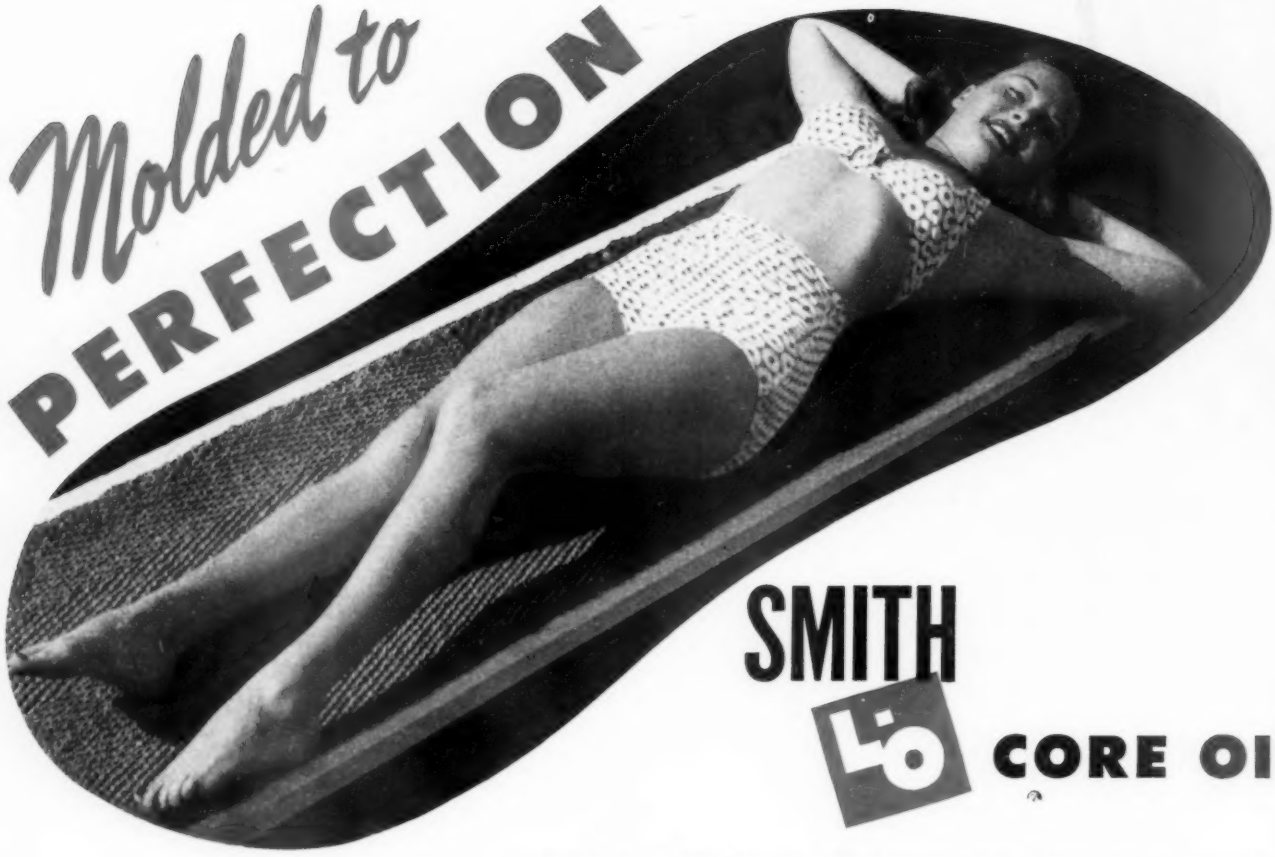

SMITH L-O CORE OIL

HELPFUL WHEN YOU TACKLE THOSE "IMPOSSIBLE" JOBS

Next time a customer gives you one of those "impossible", extremely difficult jobs . . . have Smith L-O Core Oil on hand to help you out.

You will find this core oil meets your most exacting requirements, for it boasts multiple advantages which lead to accurately shaped cores, quicker drying, reduced smoke and gas, cleaner drawing from boxes, and fewer defective castings.

Smith L-O Core Oil is the *only* core oil processed by the Dow-Therm method of heat treatment. This factor contributes to the many features mentioned above . . . is important, too, in providing a core of maximum hardness yet with sufficient flexibility to eliminate excess breakage in handling.

A trial application will give conclusive proof of its superiority . . . order from the representative nearest you.

Smith L-O Core Oil

CORE WASH ROD DIP LIQUID PARTING

Smith L-O Core Oil

WAREHOUSE STOCKS AVAILABLE
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- Southwest Foundry Supply Co. Houston 7, Texas
- Malcolm G. Stevens Arlington, Mass.
- M. W. Warren Coke Co. St. Louis, Missouri
- Western Foundry Sand Co. Seattle, Washington
- Western Industrial Supply Co. Portland 14, Oregon

SMITH OIL & REFINING CO.
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

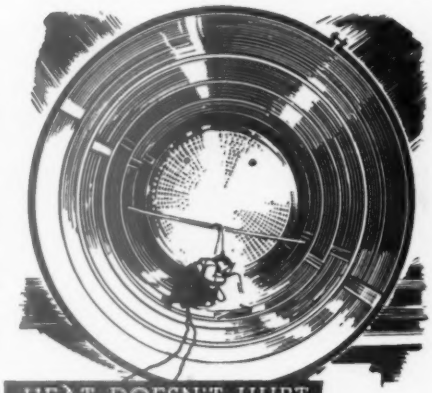
THE STORY OF COLUMBIUM

IN HONOR OF AMERICA

1 In 1801 the British chemist, Hatchett, discovered a new element and named it columbium, in honor of Columbia (America) whence came the mineral specimen he examined. For years this element seemed only an impurity in tantalum, but recently it has gained an important place in metallurgy.

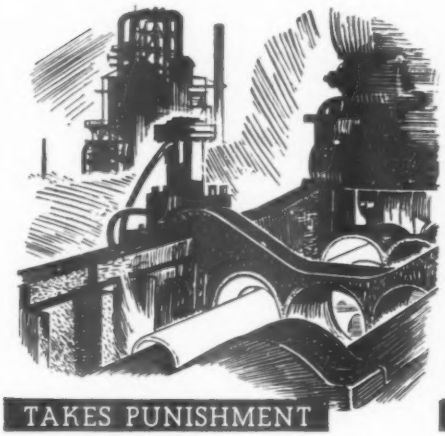
NATIVE CONVEYOR BELT

2 From a number of far-off lands come the ores of columbium, one of the scarcer metals of our earth. Here, native labor digs and carries the ore by hand to a modern washing plant which separates the ore from the gangue. From the concentrates, Electromet makes ferrocolumbium.



HEAT DOESN'T HURT

3 Columbium preserves corrosion resistance of austenitic chrome-nickel steel when heated to a high temperature. It is unnecessary to anneal welded equipment made of these steels. Fabricators may utilize forgings and castings of a size that could not be properly annealed by commercial methods.



TAKES PUNISHMENT

4 Columbium is essential for improving the creep strength of the super alloys for high-temperature applications such as blades and moving parts of gas turbines and jet propulsion engines. Columbium also reduces air hardening in the straight chromium steels, assuring ductility on cooling.

AID TO FABRICATORS

5 In chrome-nickel stainless steel equipment, welded without annealing, such as large tanks for the chemical, oil, and food industries, columbium preserves corrosion resistance. For high-temperature jobs, such as aircraft manifolds, columbium-bearing chrome-nickel steel is required.

Electromet Has Pioneered

. . . in the development and use of columbium and is the sole commercial producer of ferrocolumbium. If you seek new uses for your stainless or other alloy steels, or are faced with problems in their manufacture or fabrication, let our research staff work with you. Write to Electromet's Technical Service Department for the booklet "Electromet Products and Service." It will tell you more about columbium and other alloys and of our special service to metal producers and fabricators.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

ELECTROMET Ferro-Alloys and Metals are sold by Electro Metallurgical Sales Corporation, and Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Electromet

TRADE-MARK

Ferro-Alloys & Metal

HINES PINS

WILL NOT RUST OR STICK

NO LUBRICANT REQUIRED

HARDENED...GROUND AND CHROME PLATED

THE HINES

3431 WEST 140th ST.

S AND BUSHINGS

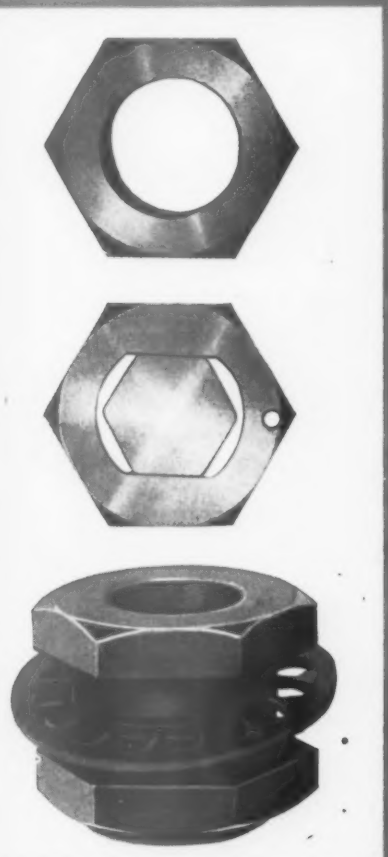
FOR ALL PATTERN PLATES AND FLASKS

Supply your pattern department with Hines Pins and Bushings and you automatically eliminate a great source of their troubles.

THE PINS—Round or Hexagon, hardened, ground and chrome plated. Extremely accurate, will not stick or rust. Made in various sizes with long or short shanks.

THE BUSHINGS—Round or oblong, held in place by simple lock washer and jam nut. Easy to install or replace. Note broad wearing surface of these hardened bushings in illustration at right. Made in two lengths—short for flasks and pattern plates up to ½" thick, and long for pattern plates ½" to 1" thick.

Write for Complete Details and Prices

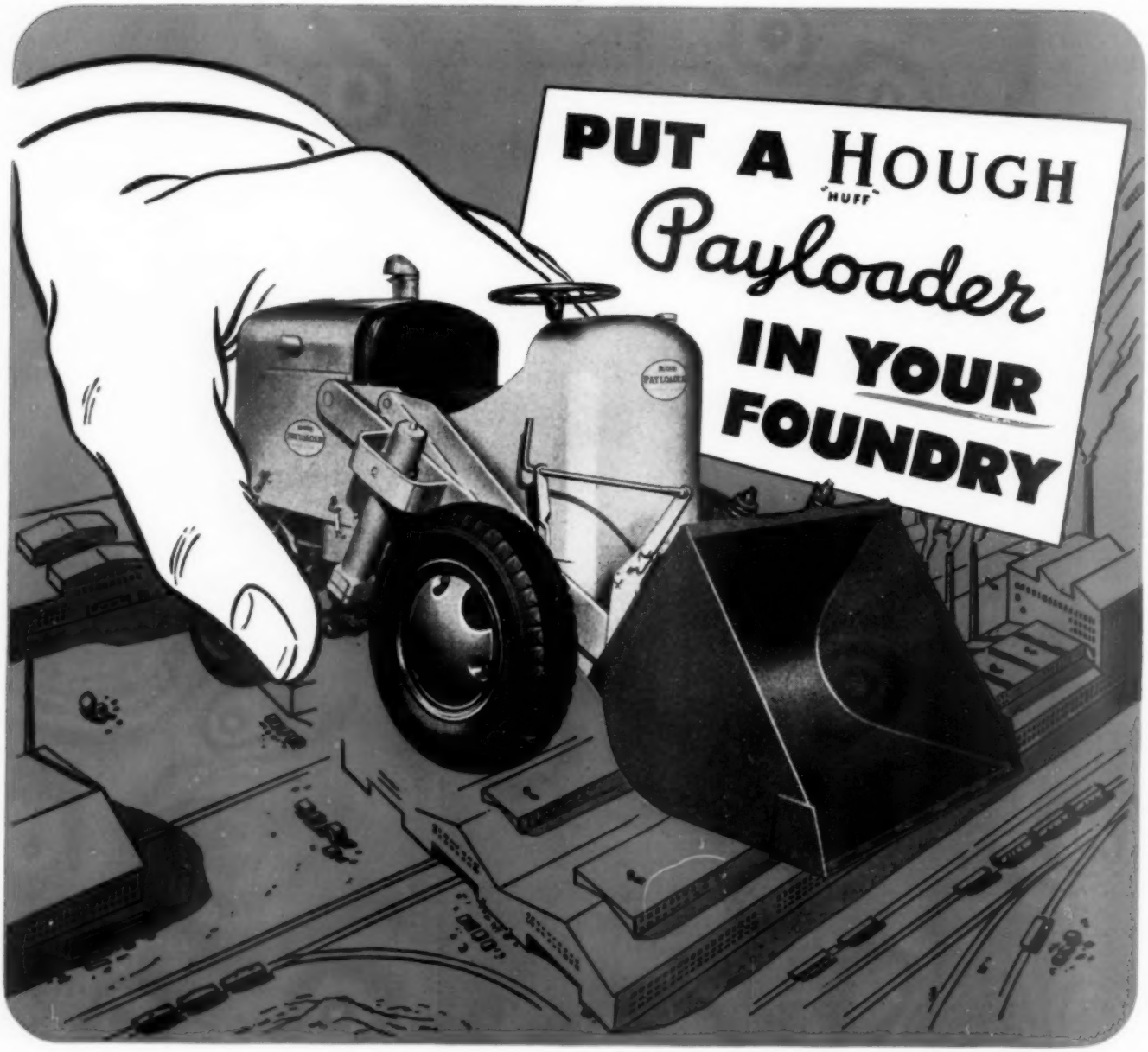


TOOLS FOR INSTALLATION

This counterboring tool and wrenches are the only tools needed for any installation of Hines Pins and Bushings.

S FLASK CO.

CLEVELAND 11, OHIO



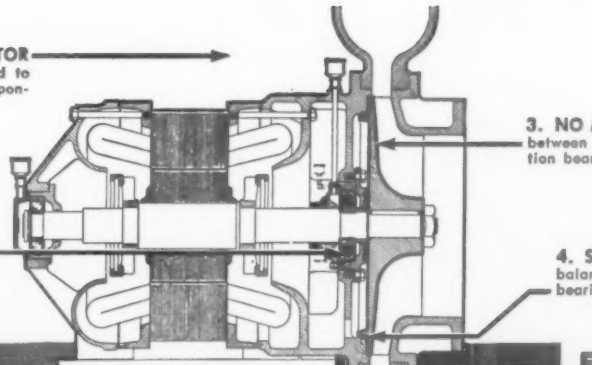
Hundreds of foundries throughout the nation are depending on Hough Payloaders for handling core and moulding sand, mixing, clean-up work — supplying sand to moulders — charging storage bins and scores of other jobs formerly requiring large crews of costly hand labor. The Model H-A Payloader (10½ cu. ft. Bucket) is ideal for foundries — small and compact, it fits through narrow aisles and doorways, maneuvers easily in congested quarters — digs, loads, carries and dumps materials exactly where needed.

Hough Payloaders are soundly engineered, based on over a quarter century of material handling experience and backed by a world-wide distributor organization. Send for complete details on the H-A and 1 yd. HL, today.

SEND for Catalog No. 162 for complete details on the H-A Payloader

THE FRANK G. HOUGH CO.
MATERIAL HANDLING EQUIPMENT SINCE 1920
703 SUNNYSIDE AVE. LIBERTYVILLE, ILLINOIS

Specify Allis-Chalmers Cupola Blowers - *IT PAYS!*

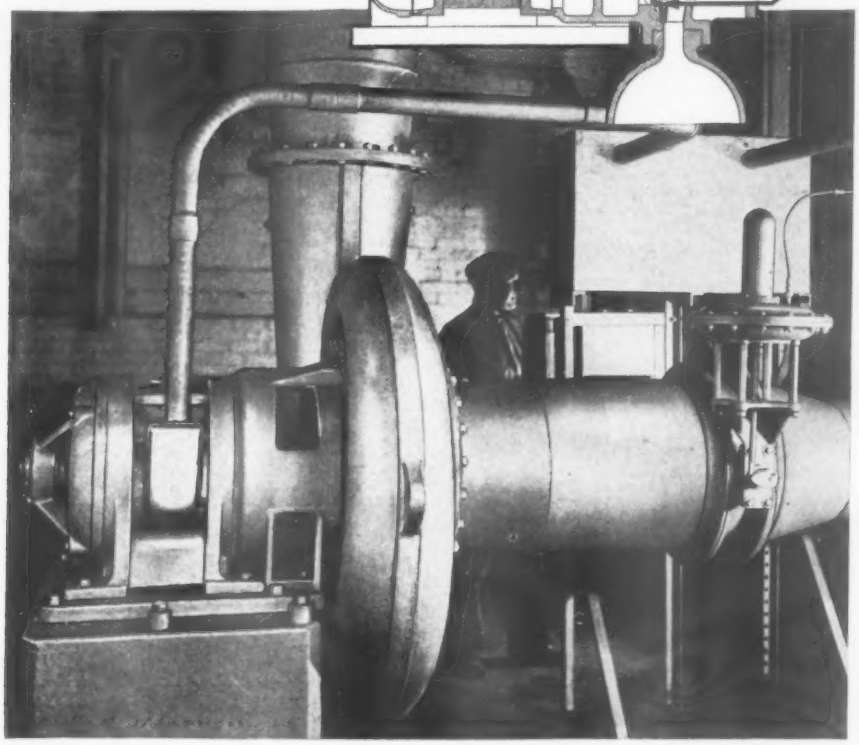


1. BOTH BLOWER AND MOTOR built by Allis-Chalmers, designed to operate together . . . entire responsibility rests in one company.

2. SIMPLE, COMPACT . . . only one moving part, the impeller which is mounted directly on the motor shaft.

3. NO METAL TO METAL CONTACT between moving parts. Heavy, anti-friction bearings are the only wearing parts.

4. SEAL RING ON IMPELLER balances end thrust . . . reduces bearing loads to a minimum.



Foundrymen, Consultants:

ONE OF THE BIGGEST FACTORS in overall cupola operating economy is the blower. That's why it's just sound business to have all the facts about all types of blowers before you go ahead.

For example: The design of *Allis-Chalmers* cupola blowers stems from over *60 continuous years* building high speed rotating equipment. Hundreds have been installed, and the very first units are still operating. Users say A-C blowers are easy to maintain . . . low in operating cost . . . that they have unusually long life.

So compare *before* you buy, prove to yourself that "it pays to specify 'Allis-Chalmers'." ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2293

A-C BUILDS BASIC MACHINES, BLOWERS, PUMPS, DRIVES, ELECTRICAL EQUIPMENT FOR FOUNDRIES

ARC FURNACE transformers in any size for any furnace application. Five separate tap positions and a change from Delta to Wye connection give a wide range of voltages.

REGULEX* CONTROL for arc furnaces lowers and raises electrodes in response to rapidly changing conditions of the furnace charge. It makes possible lower cost melts, reduces electrode breakage.

COMPLETE LINE of motor controls for every requirement of motor operation. Manual or magnetic, reversing and non reversing, across the line or reduced voltage, single or multi-speed.

SEND FOR BULLETIN 07B6092A, "Foundry Mechanization" — it's packed with helpful, usable information on the *entire* Allis-Chalmers line of heavy foundry equipment.

*Allis-Chalmers Trademark

ALLIS-CHALMERS

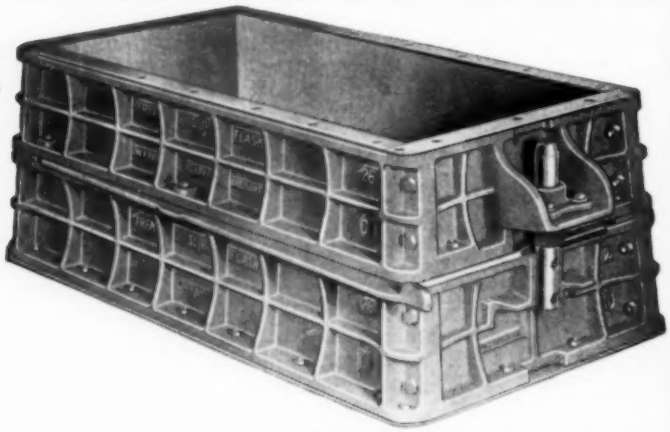
One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

A CENTURY OF SERVICE to Industry THAT MADE America Great

Cast Iron

JACKETS

Are Best by Test



FREMONT MAGNESIUM FLASKS

ACCURATE.

STURDY...

LIGHT.....

BUILT FOR LONG SERVICE AND FAST PRODUCTION

GROOVLOCK
THE FOOL-PROOF PIN

THE FREMONT FLASK CO.
Fremont, Ohio

Save Priceless Time

with the

TABOR-BRASIVE CUT-OFF MACHINE

Cross Section of Cut . . . 21 sq. in.
Material . . . . Manganese Bronze
Cutting Time . . . . . *70 SECONDS*

Table Size (Split type) — 36" x 25"
Wheel Dia. (Max. thickness 3/16")—16"
Max. Height of Work Under Wheel { 20" (With head over tables) / 46" (With head swung to side)
Motor—Enclosed fan-cooled ball bearing

THE above-all need of the day is high and ever higher production. Between pouring and shipping no time can be lost . . . and none need be.

A Tabor-Brasive Cut-Off Machine will more than keep pace with your increased production schedules. It will cut gates and risers from castings of manganese bronze, aluminum bronze, nickel, monel and other tough-cutting metals in a matter of seconds—unbelievably fast. Cuts are clean and close to the casting—snagging and finishing grinding are reduced to a minimum, often entirely eliminated.

Write for information, giving details of your cutting problems. There is a Tabor-Brasive Cut-Off Machine of a size and type to meet your requirements.

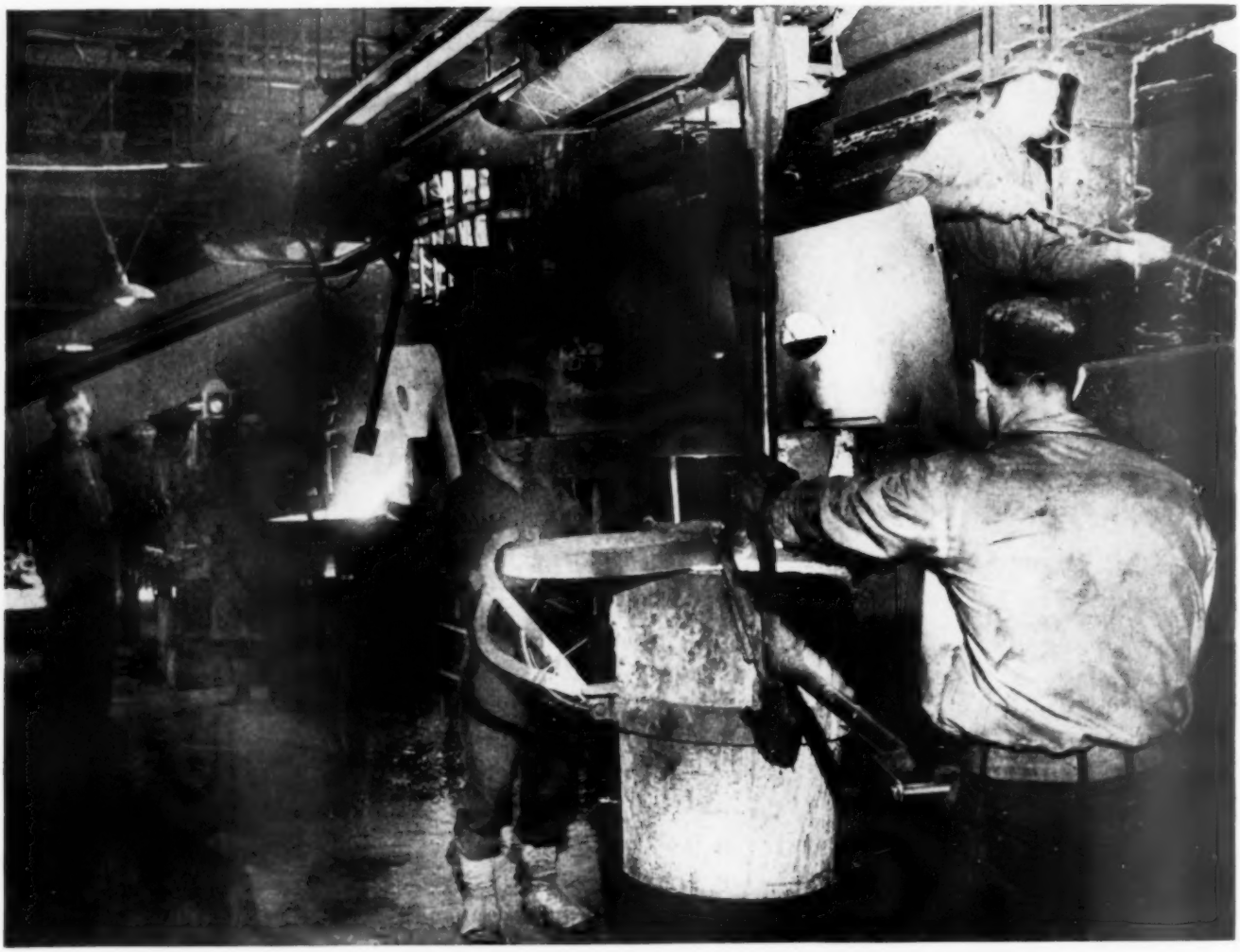
REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, California; Carl F. Miller & Company, Seattle, Washington; M. W. Warren Coke Company, 1017 Olive St., St. Louis 1, Mo.; E. R. Frost Co., Inc., Minneapolis 14, Minn.

MANUFACTURERS' ASSOCIATION INC. FOUNDRY EQUIPMENT

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

"IRONTON NOJOINT" for Foundry Ladles



"Ironton Nojoint" has been giving exceptionally good service in U-shaped and cylindrical receiving, mixing, and desulphurizing ladles, especially where "Purite" is used.

Now many progressive foundrymen are using it to line their pouring ladles with the same good results. For these pouring ladles, we furnish Fine "Ironton Nojoint" instead of the coarser product used in desulphurizing ladles.

May we send you detailed information on this plastic refractory designed for metallurgical service?

THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

SWAN-FINCH CASE HISTORY No. 246
(name on request)
Product: Brass Valves
Mixing Equipment: Muller
Core Mix: 72 qts. Michigan City Lake Sand
24 qts. Berlin Sand, 24 qts. Molding Sand, 6 pts. RD3-159 Core Oil, 1½ pts. Kerosene, Water to temper.
SAVINGS IN BINDER: (with cores equal in every respect!
With Satco RD3-159 replacing linseed oil truly substantial savings were made in the cost of binder.
EXTRA Benefits: No change needed in oil-sand ratio.

LINSEED OIL OUT . . .

"CUSTOM-MADE" CORE OIL IN . . .

RESULT: BIG SAVINGS

. . . WITH CORES EQUAL IN EVERY RESPECT!

Cases where Swan-Finch "custom made" core binders replace linseed oil and bring big benefits continue to multiply. And where practices and methods are different, equally improved results are piling up too. *Your* first step towards binder savings is to call in a Swan-Finch engineer. His extensive experience with foundry conditions and binder properties includes a knowledge of problems similar to *yours.*

The Swan-Finch engineer and his thorough analysis of your foundry *without interruption of production* is yours to call upon *without obligation.* Swan-Finch's 95 years of experience in supplying specialized lubricants backs him up. Act today!

SWAN-FINCH OIL CORPORATION

Reg. U. S. Pat. Off. R. C. A. BUILDING WEST • NEW YORK 20, N. Y.

3704

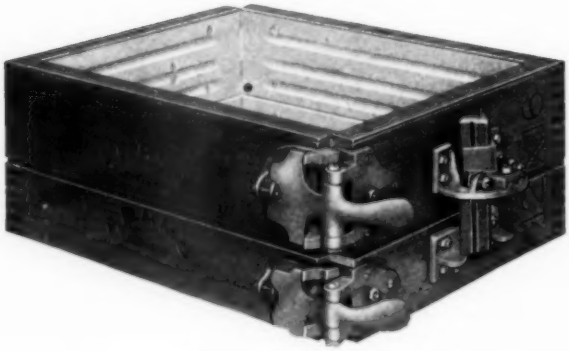
Patent No. 2055548

ADAMS STEEL JACKETS

Patent No. 2124639

ADAMS JACKETS

Cast Iron and Aluminum



Patent No. 2228856

ADAMS CHERRY SNAP FLASKS

With Adjustable Lever Latch
STRAIGHT OR TAPERED

Patent No. 2066547

ADAMS CHERRY SLIP FLASKS

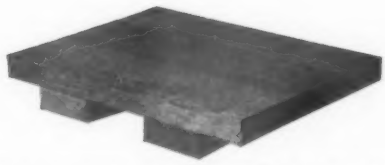
Here is the complete line o

Specify ADAMS FOUNDRY EQUIPMENT

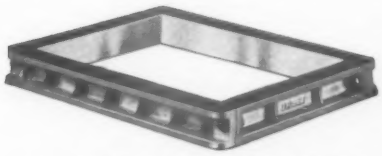
For half a century Adams Flask Equipment has been recognized as a leader. Custom built by experts for strength and long life and utilizing the finest materials available, it has become an important factor in better molding practice. Whatever your requirements get in touch with Adams. Write for descriptive literature, today. THE ADAMS COMPANY, 800 Foster St., Dubuque, Iowa.

THE ADAMS
DUBUQUE,

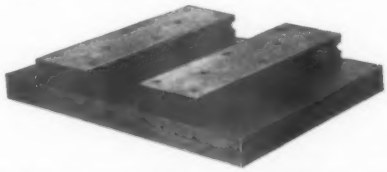
MOLDING MACHINES . . . . . FLASK



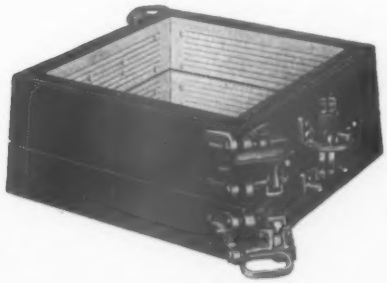
ADAMS WOOD BOTTOM BOARD



ADAMS ALUMINUM UPSET



ADAMS CHERRY PRESSER BOARD

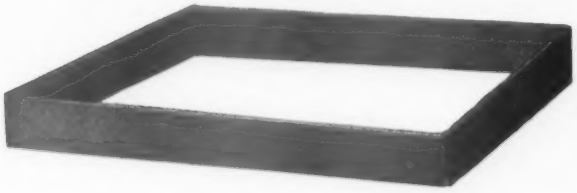


Patent Applied For

ADAMS CHERRY EASY-OFF FLASK

Patent No. 2066547

ADAMS ALUMINUM SLIP FLASKS



ADAMS STEEL BANDS

ne of FLASK EQUIPMENT

Cherry Snap Flasks
Cherry Slip Flasks
Aluminum Slip Flasks
Easy-Off Flasks
Cherry Presser Boards
Wood Bottom Boards
Steel Bottom Plates

Steel Jackets
Aluminum Jackets
Cast Iron Jackets
Steel Bands
Steel Upsets
Cherry Upsets
Aluminum Upsets

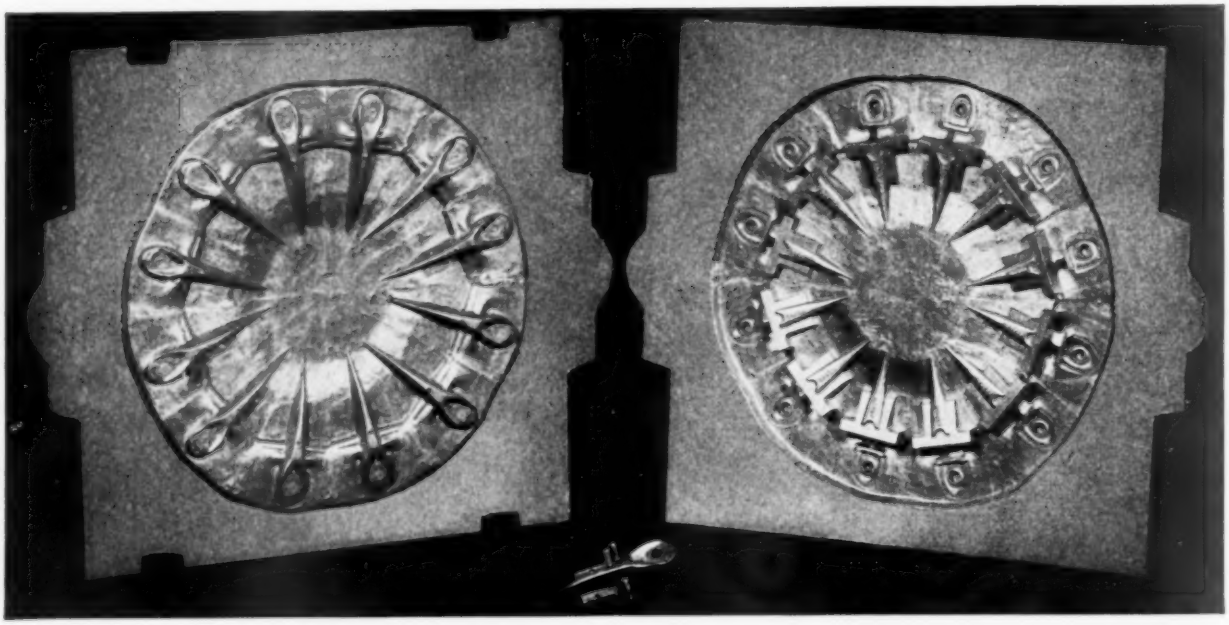
COMPANY

IOWA, U.S.A.

EQUIPMENT . . . . . Established 1883

FOUNDRYMEN:

At this critical time, with labor and material costs mounting, PRESSURE CAST MATCH-PLATES and COPE & DRAG PLATES are the solution to lower production costs.



Cutter guard for mowing machine, 12 on cope and drag, made from one master.

SINGLE OR MULTIPLE PATTERN MATCHPLATES MADE FROM ONE MASTER PATTERN AND CAST UNDER PRESSURE IN PLASTER MOLDS

• •

Write us for quotations

Matchplate made from master pattern.

PLASTER PROCESS CASTINGS COMPANY

6922 Carnegie Avenue — Cleveland 3, Ohio

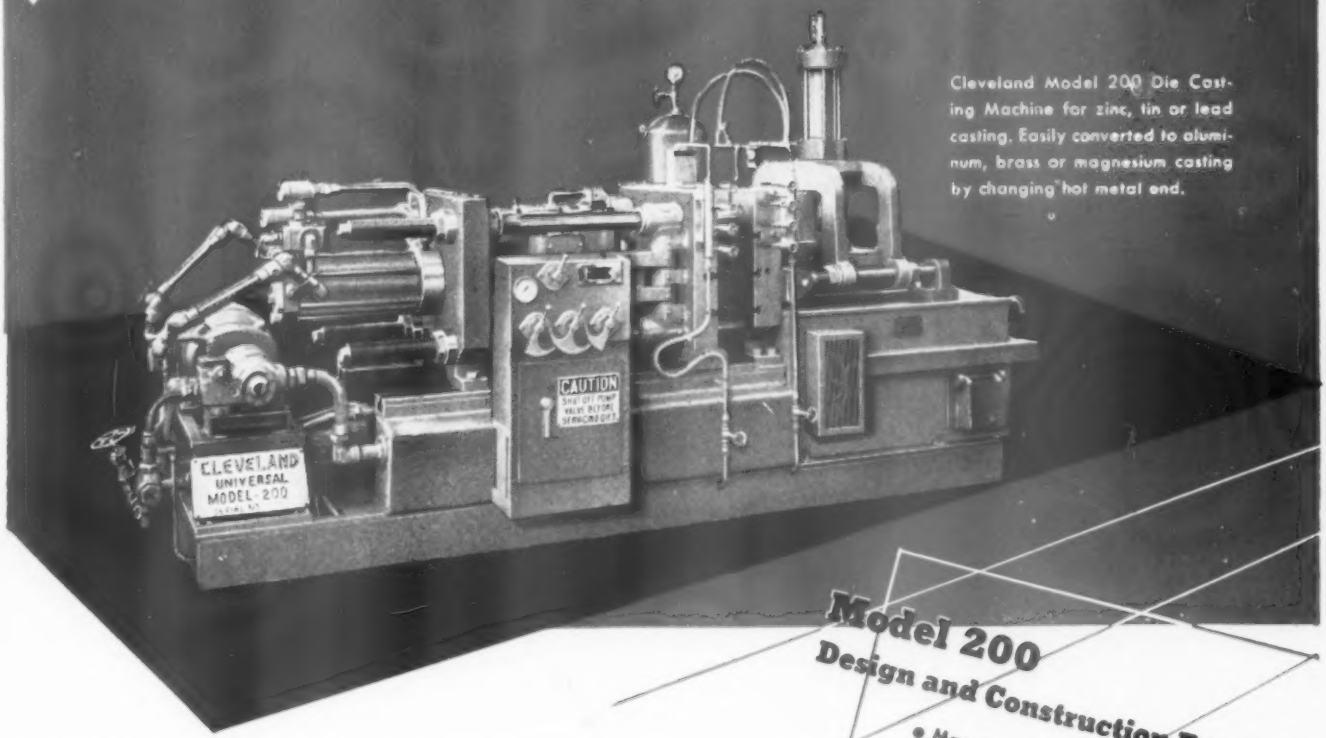
Pressure-Cast MATCHPLATES
COPE and DRAG PLATES

(Toledo Matchplate Company, Toledo 2, Ohio—Affiliated)

PROFIT BY OUR MANY YEARS OF EXPERIENCE

Announcing

THE NEW CLEVELAND MODEL 200
Universal High-Pressure Hydraulic
DIE CASTING MACHINE



Cleveland Model 200 Die Casting Machine for zinc, tin or lead casting. Easily converted to aluminum, brass or magnesium casting by changing hot metal end.

Model 200
Design and Construction Features

- Manual or full automatic control
- Easy accessibility
- Fast injection speed
- Mechanical or hydraulic ejection
- Platen supported by bronze wedges
- Die stroke adjustable by hand crank
- Die movement controlled by safety valve
- Heat exchanger and oil filters
- Hardened toggle pins and bushings
- Seamless steel tubing hydraulic system
- Swivel fittings on die and shot ends
- Nitrided gooseneck sleeve
- Gas, electric or oil-fired furnace available

RIGID · · · FAST · · · FLEXIBLE!

The new Model 200 Die Casting Machine is the result of intensive Cleveland research to design a machine having platens approximately 27"x27", capable of locking dies with tremendous pressure to produce castings of highest quality at high speed.

The Model 200 incorporates all the superiorities of the widely used Model 400 Cleveland. Construction permits the maximum amount of interchangeability. On both models, platen and die plate T-slots are identical in size and location—goosenecks, nozzles, plungers, sleeves, etc., are interchangeable.

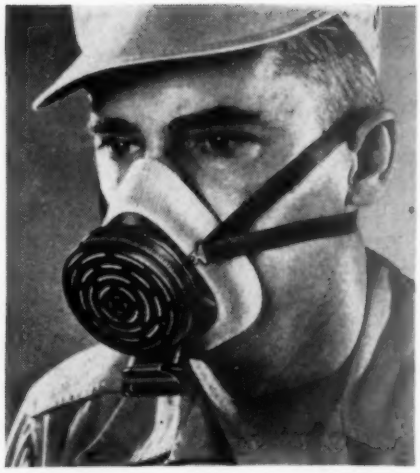
Every requirement for fast, accurate, profitable die casting is met by the new Model 200. Investigate this outstanding Cleveland development. Write today for new bulletin and complete information.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4926 BEECH STREET • • CINCINNATI 12, OHIO

CHICAGO (6) 3710 Civic Opera Bldg. CLEVELAND (14) 1114 NBC Bldg. DETROIT (2) 540 New Center Bldg.
HARTFORD (1) 529 Capital National Bank Bldg. NEW YORK (6) 2402 Singer Bldg.

NEW AO R-2000 RESPIRATOR



WITH THE CHEMICALLY TREATED FILTER

Visualize dust as small as 24 millionths of an inch diameter which the R-2000 filters out and you will appreciate the impetus given to respiratory protection which this new respirator provides! Comfort combines with protection, too, because the compact, chemically treated felt filter is as efficient as previous filters 8 times its size — thus permitting the use of a smaller filter container for increased front and side vision and greater wearing ease.

Other advantages include no increase in low breathing resistance — disposability of the filter — gauze pre-filter for extending filter life by barring the passage of larger dust and dirt particles. Special lightweight face shield may be used with the R-2000 to protect eyes and upper face. The respirator has the approval of the Bureau of Mines.

AO has a complete line of respirators for protection against light concentrations of gases and vapors.

*As compared with similar untreated filters.

American Optical COMPANY — *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL INDUSTRIAL CITIES

He gives bearings a rub-down to put curves in the right places

. . . for faster operation, greater accuracy, maximum load capacity

IN the final manufacturing process, Timken T-type thrust bearings are assembled and processed so that the surfaces of the ribs, rollers and races are generated as a unit. The bearing thus becomes a "Generated Unit Assembly".

This extra process produces a smoothly-curved area of contact between the end of each roller and the cone rib against which it operates, so that the convex shape of the roll end and the concave surface of the cone ribs are identical in contour.

We developed this process years ago for thrust bearings which must operate under extreme loads with high roll end pressures against the cone ribs and since have adapted it to other Timken bearings, including those used for precision machine tools, steel mill and railroad equipment and other applications.

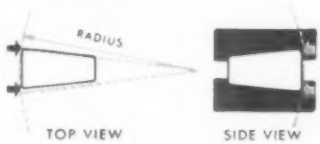
Today "Generated Unit Assembly" reduces friction and wear to the vanishing point; increases load capacity; assures positive roll alignment; eliminates the need of breaking-in or final adjustment on the job; and lengthens bearing life. It is one of the many reasons why it pays to have Timken bearings in every machine you manufacture or buy.

REMEMBER, Timken bearings are produced by the only bearing manufacturer in the country making its own steel and Timken is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels. The Timken Roller Bearing Company, Canton 6, Ohio.

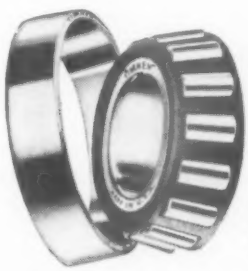
GENERATED UNIT ASSEMBLY

Extra manufacturing process makes Timken heavy duty thrust bearing a "Generated Unit Assembly".

CURVED AREA RIB CONTACT



Curved area of roll end (at arrows) fits perfectly the curve of upper and lower ribs of this thrust bearing.



TIMKEN

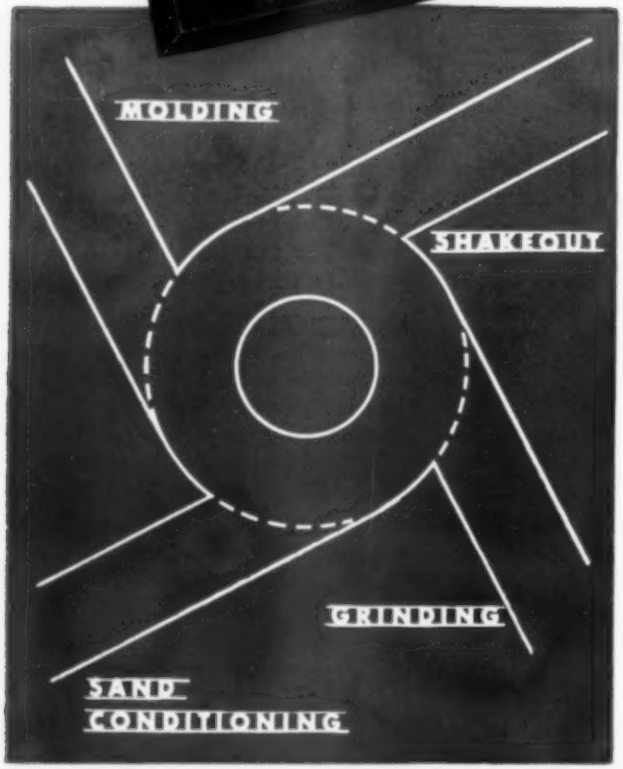
TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ◫

A SCHNEIBLE SYSTEM ALWAYS FITS *Available Space*

- ***No Tearing Down of Foundry Layout***
- ***No Slow-Down or Stoppage of Production***



Keep production humming while your Schneible dust and fume removal system is being installed — it's no puzzle for Schneible engineers to find that one available space for the completely adaptable and flexible Multi-Wash Collector. In head room, lantern, corners, unused floor space; outside or on the roof — the Collector can eliminate the contamination from one or more operations with direct duct work that fits right into your plant set-up.

Featuring dirty air inlets at a TANGENT to the collector bottom, the Multi-Wash unit permits connection of ductwork from any direction. One centrally located collector can remove dust, smoke, fumes, etc. from several trouble spots as shown at left . . . eliminates accumulation of all ductwork into one header. Whirled up through the impingement stages and series of water curtains and sprays in the collector by an exhaust fan on the *clean air side*, all contamination is flooded out for easy disposal as sludge.

No interference with production during installation . . . no more trouble with contaminated air after installation . . . that's the Schneible one-two punch that will solve one of your biggest foundry problems. Send for Bulletin 47.

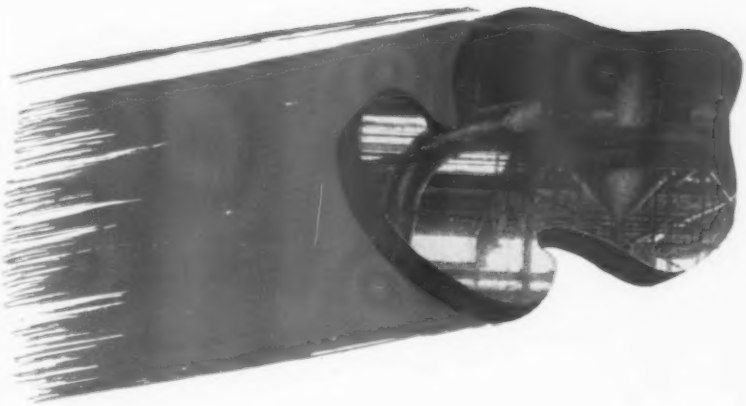
CLAUDE B. SCHNEIBLE CO.

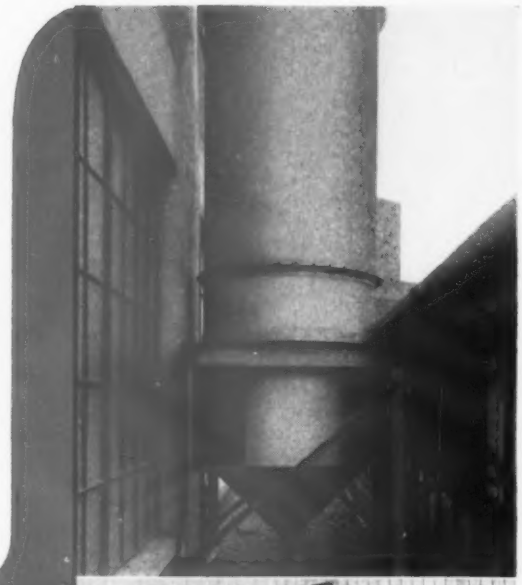
2827 Twenty-Fifth St., Detroit 16, Mich.

Engineering Representatives in Principal Cities

SCHNEIBLE

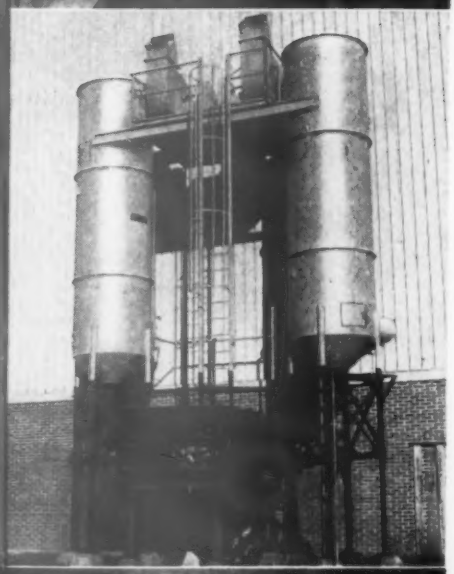
LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION





ON THE ROOF

Set up on the roof of a Michigan foundry, this Schneible Multi-Wash Collector is ready for connecting ductwork. Note dirty air inlet tangent to collector below first impingement plate.

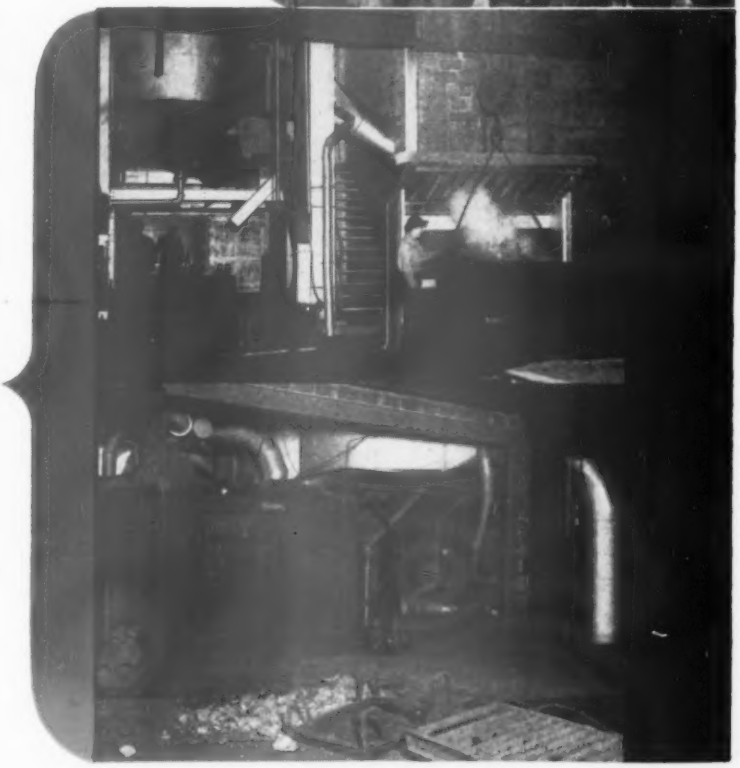


OUTSIDE

An Oklahoma plant uses two Schneible Multi-Wash Collectors on the outside wall. They form a compact set-up with the Schneible Dewatering Tank in the center for settling and disposal of collected contamination in form of sludge and for reclaiming water for recirculation in system.

OVERHEAD

Some unused head room is just the spot for the Schneible Multi-Wash Collector in this foundry. Steam and dust from the shakeout are whipped right into the venturi louvers of the Schneible "Uni-Flo" hood at right.

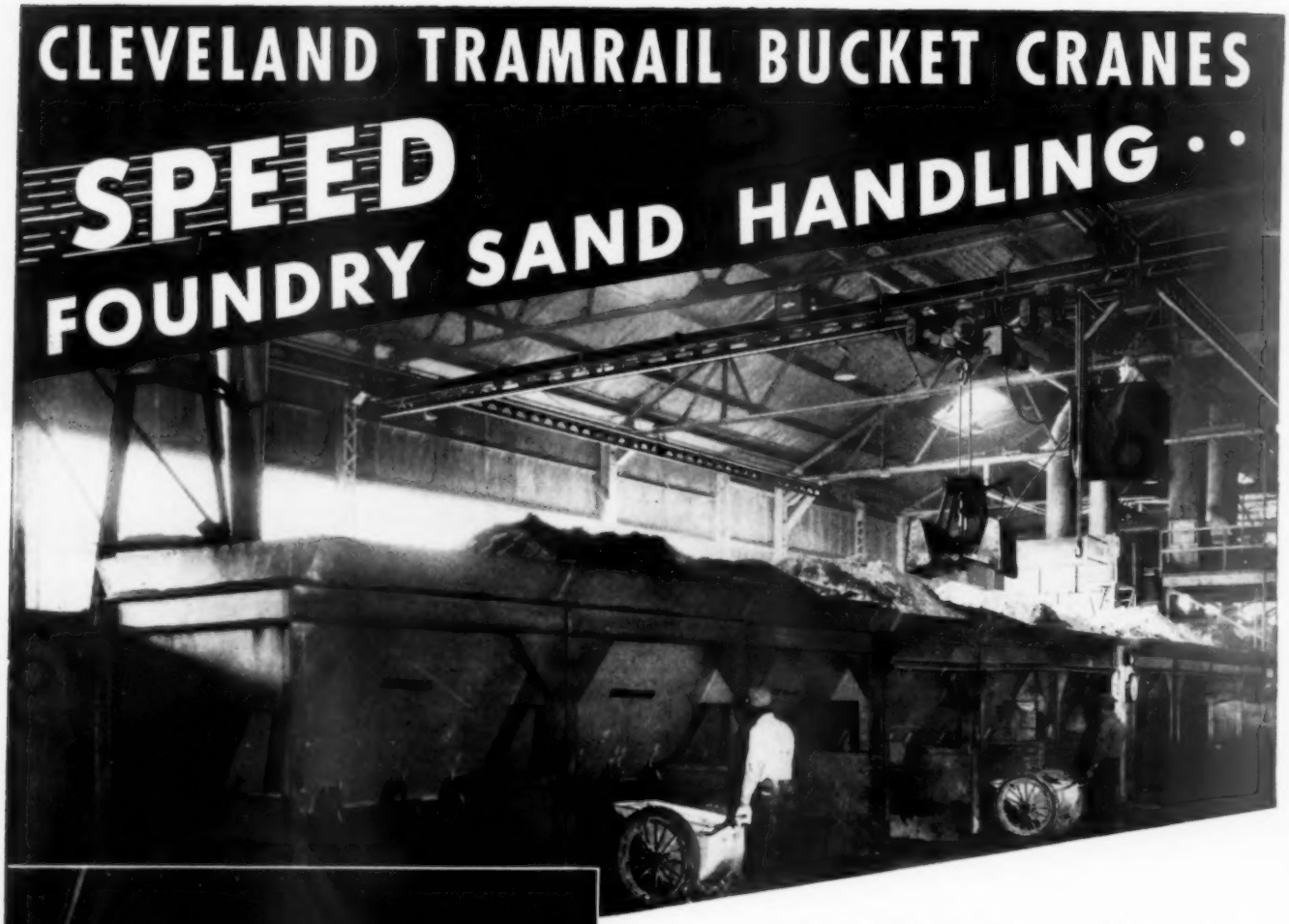


IN UNUSED CORNERS

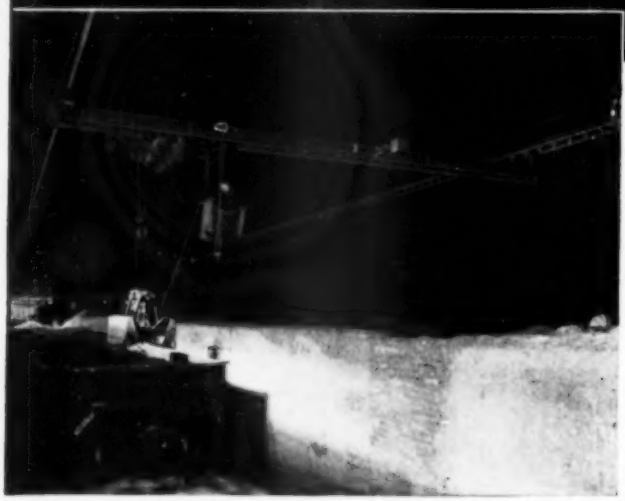
Tucked away in the corner of a Pennsylvania plant, this Schneible Multi-Wash Collector takes care of contamination from cleaning room equipment.

CLEVELAND TRAMRAIL BUCKET CRANES

SPEED FOUNDRY SAND HANDLING ••



This crane has been operating successfully for 4 years, 24 hours a day. The single line grab bucket requires no motor and is of a type that eliminates most of the usual impact on crane. The bucket is easily detached when it is desired to handle loads with the crane hook.



The cranes are 44'-0" long and operate on two-track runways. They are controlled from either platform or floor by pendant push-button stations.

AN AVERAGE of nine 60 ton gondola cars of sand are handled every 24 hour working day with two Cleveland Tramrail Platform-controlled motorized cranes with ½ yard buckets in a large Illinois foundry.

Some of the sand is taken to storage and later transferred to bins. Other sand is taken to storage, then to drier and finally to bins, thus is handled three times with the cranes. As the sand is handled one to three times, it is evident that somewhere between 1000 and 1500 tons are handled every day.

The cranes, which are operated by both men and women, have served in this rigorous work for several years with need of only minimum maintenance.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

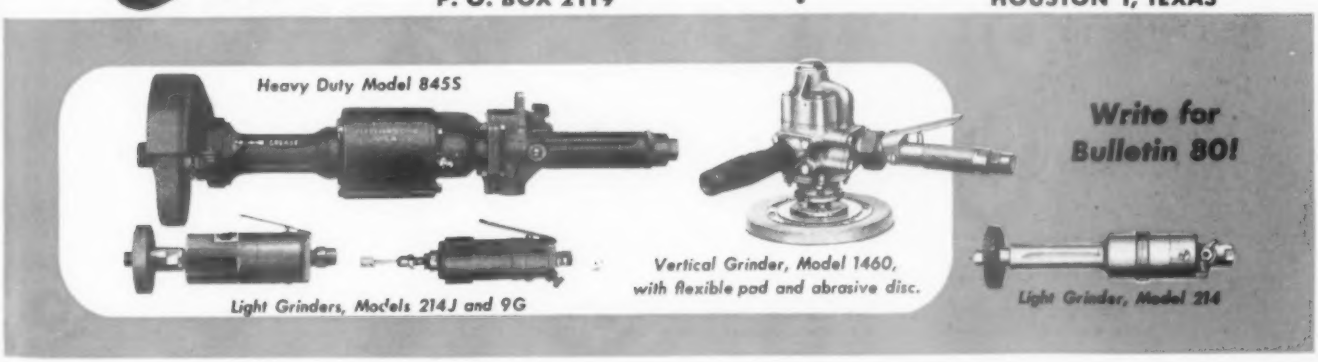
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3807 East 286th St. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

You get plenty of power from easily-held, smooth-running *CLECO GRINDERS*

FROM "snagging" in the cleaning room to light finishing on forgings, dies, etc., you will find the *right* model for *every* job in the extensive line of Cleco Rotary Grinders. These grinders feature rugged alloy steel rotors, heat treated and ground to exact size — insuring vibration free operation at all speeds. Governors efficiently control the speed, whether idling or under varying loads, providing ample power at all times plus utmost economy in air consumption. Highest grade ball bearings are used throughout. An efficient lubrication system helps increase the life of the tools. Bulletin 80 describes Cleco Grinders in detail and includes a large blueprint of construction details. *Ask for it!*

Cleco **PNEUMATIC TOOL DIVISION**
of THE REED ROLLER BIT COMPANY
P. O. BOX 2119 • HOUSTON 1, TEXAS


Heavy Duty Model 845S
Light Grinders, Models 214J and 9G
Vertical Grinder, Model 1460, with flexible pad and abrasive disc.
Write for Bulletin 80!
Light Grinder, Model 214

Shoot for lower grinding costs

You can deal your excess grinding costs a fatal blow!

Call in Peninsular engineers . . . they are experienced trouble-shooters in grinding operations. Perhaps they can kill a profit leak for you—where you didn't know a saving was possible. They've done it for others!

Peninsular engineers examine everything about your grinding operations—the machinery used, materials ground, the finishes required. After a thorough analysis of these factors, Peninsular develops and recommends wheels specifically designed to fill your needs.

Peninsular has been successfully shooting for lower production expenses in almost every industry for 58 years.

Let them hunt down any excess in your grinding expense—no cost to you.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

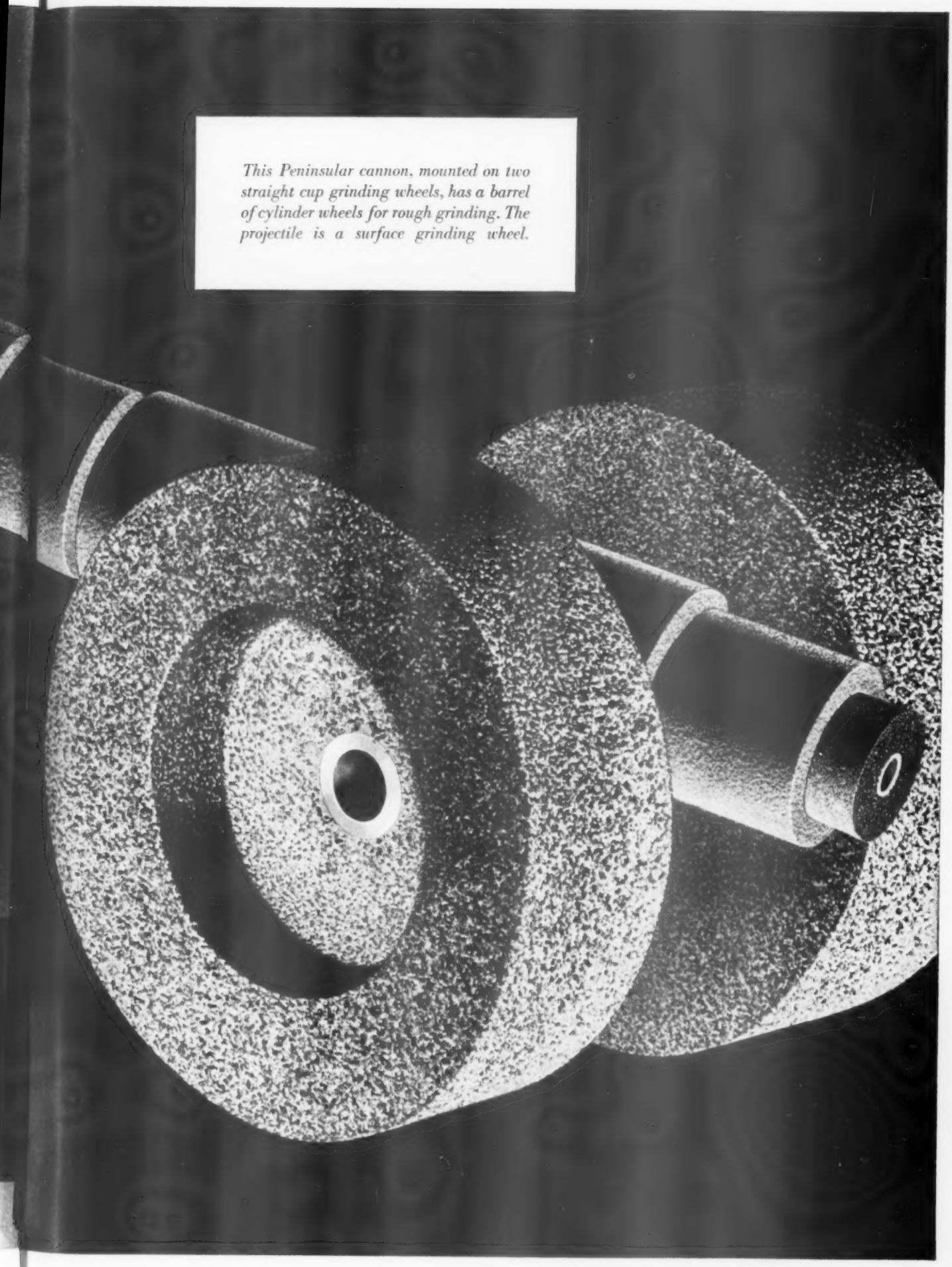
PENINSULAR

INDIVIDUALLY PENINSULAR ENGINEERED

GRINDING WHEELS

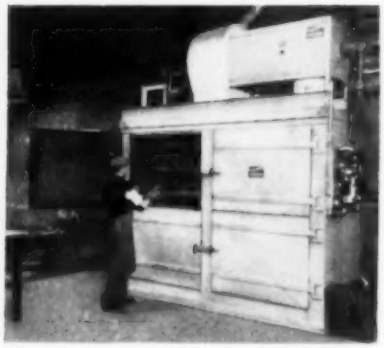
SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

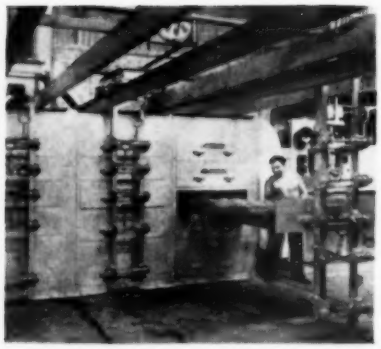


This Peninsular cannon, mounted on two straight cup grinding wheels, has a barrel of cylinder wheels for rough grinding. The projectile is a surface grinding wheel.

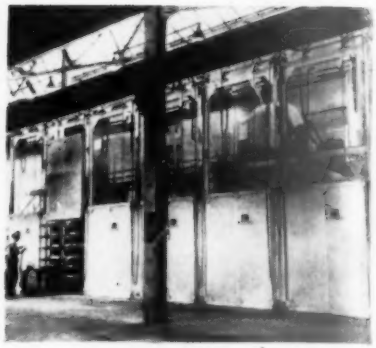
COLEMAN OVENS *Give*



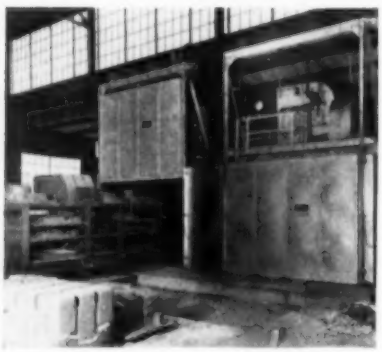
COLEMAN SHELF TYPE CORE OVENS. For limited production of small or medium cores. Available with gas or oil-fired recirculating heating systems.



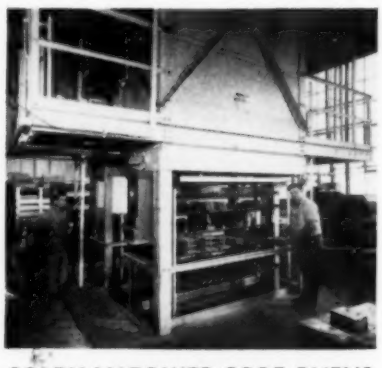
COLEMAN ROLLING DRAWER CORE OVENS. For larger production of small and medium cores. Available in a wide range of sizes and capacities.



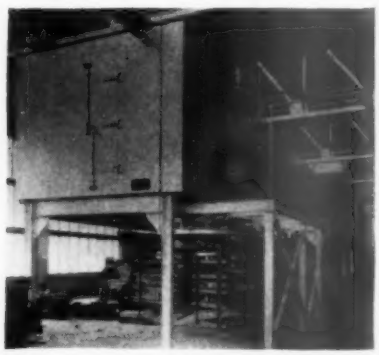
COLEMAN TRANSRACK CORE OVENS. For operation with portable racks to reduce handling. Single or multiple rack capacity per compartment.



COLEMAN CAR TYPE OVENS. For baking large cores or drying molds. Most of the large core and mold ovens in operation in every class of foundry production are Coleman Car Type Ovens.



COLEMAN TOWER CORE OVENS. For high speed production at lowest labor cost. Patented Center Passageway permits loading from inside and outside the Tower to provide maximum accessibility and loading speed.



COLEMAN HORIZ. OVERHEAD CONVEYOR CORE OVENS. For production departments employing large number of coremakers on such work as automotive, agricultural, etc., this design offers certain special advantages.

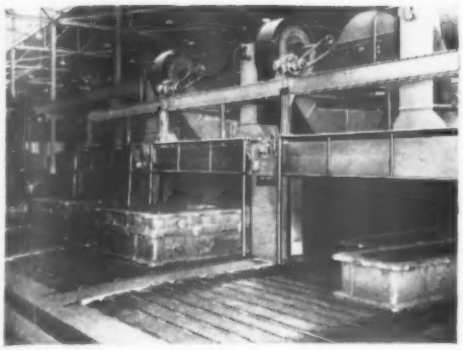
World's Oldest and Largest Foundry

The FOUNDRY EQUIPMENT

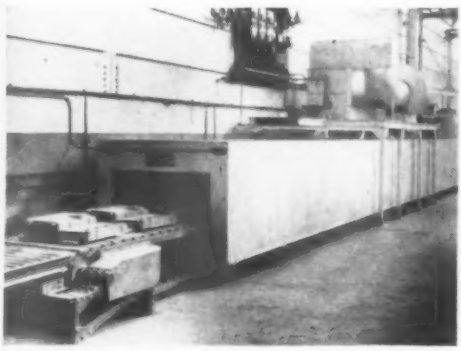
CLEVELAND 13, OHIO, U. S. A.

BUILDERS OF COLEMAN AND SWARTWOUT

Every Job the Right Start



COLEMAN CONVEYOR MOLD OVENS. For high speed continuous drying of molds. These ovens have revolutionized mold drying practice, giving amazingly increased production speed at a fraction of the cost of former methods.



COLEMAN FLIGHT CONVEYOR OVENS. For redrying cores and core assemblies after pasting, blacking or washing. These high speed ovens are available in range of sizes and capacities to suit all requirements.

GOOD CASTINGS DEMAND GOOD CORES

Coleman Ovens eliminate all core baking uncertainties. They remove the many variables in core baking that are responsible for a large percentage of casting rejects due to improperly baked cores.

Profit by Coleman know-how! Coleman oven engineers offer a background of greatest experience—more than 40 years of continuous specialization in the ***foundry oven field*** and a record of more than 9,000 successful installations in all classes of foundry production.

Coleman Ovens quickly pay for themselves through labor savings in the elimination of unnecessary losses. Increased production, lower fuel costs and improved working conditions are further advantages.

Coleman Ovens are built in all conventional types and sizes as well as specially engineered installations to meet each and every operating requirement.

Perfect baking is guaranteed with all fuels. Coleman Ovens may be operated with any "automatic" fuel such as gas, oil, electricity, powdered or stoker coal, etc., whichever is most economical to obtain in your district.

Write for Folio of Bulletins

ry Oven Specialists!

T Company

MEMBER

UT OVENS

COLEMAN CORE and MOLD OVENS

How 19,000 companies up take-home pay *without upping payrolls*

Can you deduct $18.75 from $60.00 and get $66.25? *Yes.* And the way you can do it is mighty important to your company—and to the nation!

You start with $60, representing someone's weekly take-home pay. You deduct $18.75 for the purchase of a U.S. Savings Bond. That leaves $41.25. But $41.25 isn't what the worker takes home. He takes home $41.25 *plus a $25 Savings Bond.* Total (assuming he holds the Bond till maturity): *$66.25.*

WHAT 19,000 COMPANIES HAVE LEARNED

In the 19,000 companies that are operating the Payroll Savings Plan for the regular purchase of Savings Bonds, employees have been more contented in their jobs—absenteeism has decreased—even accidents have been fewer!

Those are the "company" benefits the Plan provides, in addition to extra security for individual employees.

But the Plan has other, far-reaching benefits of basic importance to both your business and the national economy...

SPREADING THE NATIONAL DEBT HELPS SECURE YOUR FUTURE

The future of your business is closely dependent upon the future economy of your country. To a major extent, that future depends upon management of the public debt. Distribution of the debt as widely as possible among the people of the nation will result in the greatest good for all.

How that works is clearly and briefly described in the free brochure shown at the right. Request your copy—*today*—from your State Director of the U. S. Treasury Department's Savings Bonds Division.

ACTION BY TOP MANAGEMENT NEEDED

The benefits of regular Bond-buying are as important today as ever—but war-time emotional appeals are gone. Sponsorship of the Payroll Savings Plan by a responsible executive in your company is necessary to keep its benefits *advertised to your employees.*

Banks don't sell Savings Bonds on the "installment plan"—which is the way most workers prefer to buy them. *Such workers want and need the Payroll Savings Plan.*

Those are the reasons why it's important to make sure that the Plan is adequately maintained in your company.

The State Director will gladly give you any assistance you wish.

"The National Debt and You,"

a 12-page pocket-size brochure, expresses the views of W. Randolph Burgess, Vice Chairman of the Board of the National City Bank of New York—and of Clarence Francis, Chairman of the Board, General Foods Corporation. Be sure to get your copy from the Treasury Department's State Director, Savings Bonds Division.

The Treasury Department acknowledges with appreciation the publication of this message by

THE FOUNDRY

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council

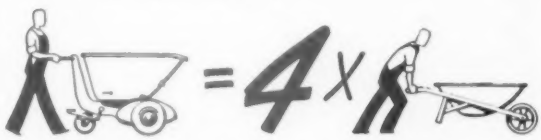
AT LAST! . . . the answer to the basic need in materials handling

SEE the BELL *Prime-Mover* at Booth 714, National Materials Handling Exposition. Cleveland Auditorium, Jan. 12-16.

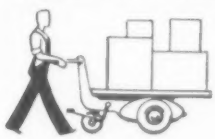
The BELL Prime-Mover

ONE MAN DOES THE WORK OF FOUR

Ten cubic feet capacity at a fuel cost of a few cents per hour saves many dollars a day



TAKES PLATFORM LOADS...REMOVES SNOW



Platform body quickly adapts *Prime-Mover* for staked or unstaked loads up to 1,000 lbs. Snow plow attachment is built for long, hard service.

Here's a 10 cu. ft. bucket that cuts the cost of handling sand, mixing batches, charging bins and other work...and in a jiffy it becomes an efficient platform carrier for castings, cope and drag plates, and other cumbersome loads! This is a *new kind* of power equipment now made available for the first time in history by the Bell Aircraft Corporation.

Unlimited in flexibility, the BELL *Prime-Mover* is a ruggedly built, mechanically dumping carrier . . . interchangeable for platform loads without use of tools. It turns in less space than a hand barrow, twists through tight spots, ascends 20° grades with full loads. Simple controls and full visibility assure safe operation by any workman. Proved results: reduced fatigue and better employee morale, along with *increased individual productivity*.

Low cost from first to last is inherent in the BELL *Prime-Mover*. It has no chains or belts in engine and transmission; gears and clutch run in oil, fully enclosed. One 3-gallon tankful of fuel is good for 8 hours of efficiency.

Zero pressure tires are available as standard equipment.

A PRODUCT OF BELL *Aircraft* CORPORATION

SEND COUPON NOW

Bell Aircraft Corporation
P. O. Box D, Buffalo 5, N. Y.

Please send me engineering and cost data on the *Prime-Mover*, including operating experience in.....(type of work).

Name .....

Company .....

Address .....

City, Zone & State.....

The Pittsburgh Steel Foundry Corp.

OF GLASSPORT, PA.

. . . does a 100 hour job in 44 minutes

AIRCO TECHNICAL SALES SERVICE REPORT

PROBLEM: To remove this 52-inch, 7-foot high riser from a 50-ton cast steel anvil block.

SOLUTION: We recommended cutting with an Airco No. 40 Radiagraph equipped with a Style 6740 water-cooled torch. Two cuts were made; the first five inches from the finish line. Then, after inspection (no defects were visible), the second and last cut was made one inch from the body of the block. This entire job was completed in 44 minutes.

Pittsburgh Steel Foundry Corp. estimates flame cutting to this close tolerance permitted a saving of approximately 100 hours machining time.

R. J. Helmkamp

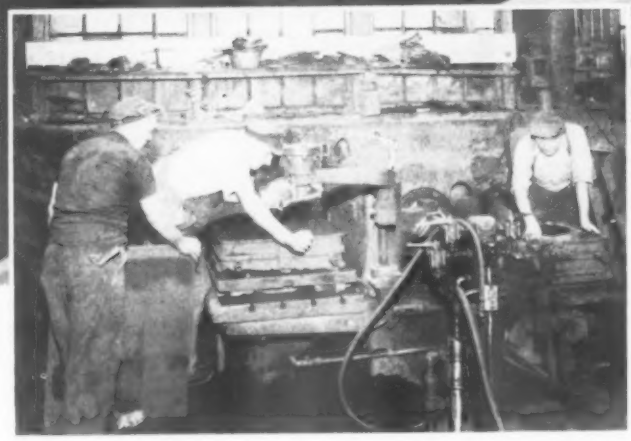
Airco Technical Representative

Airco's Technical Sales Division is at the call of all industry in applying Airco processes and products in the solution of their problems. If you have a metal working problem, ask to have a Technical Sales Division man call. Address: Dept. F- 6910, Air Reduction, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., Houston 1, Texas.

AIRCO AIR REDUCTION

Offices in All Principal Cities

TECHNICAL SALES SERVICE—ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS



"DAVENPORT" Model "A" No. 34

Perfect Timing
TO OBTAIN MAXIMUM EFFICIENCY
IN BETTER Molding

To provide maximum efficiency and production, controlled timing is necessary on all foundry operations. DAVENPORT molding machines make this possible in the molding department.

Write today and let us send you our complete catalog on DAVENPORT molding machine equipment. DAVENPORT will give you controlled timing and better molds in less time at lower costs.

CANADA: Canadian Foundry Supplies & Equipment Ltd., Toronto and Montreal
FRANCE: Ph. Bonvillain & E. Ronceray, Choisy-le-Roi, Rue Paul Carle, Seine, France
SOUTH AFRICA: Koppel Engineering Co. (Pty.) Ltd., Johannesburg, South Africa

DAVENPORT MACHINE AND Foundry Company
DAVENPORT IOWA U.S.A.

...We Shook Out the Pickpocket's Dust Pockets

to save this plant

$6000.00 Yearly

In the plant shown here, 25 tons of dust a day, produced from woodworking operations, could have formed dust pockets which would have ruined efficiency as well as created a hazard.

But — a Pangborn dust control system was installed to collect and dispose of the dust. As a result, the shop area "is remarkably clean and clear of dust". The wood waste, removed from the air, is deposited directly into storage hoppers for disposal. And, the air, after cleaning, *returns* to the working area, resulting in a saving in heating expense alone of about $6,000.00 a year.

A "Dust Pocket Survey" of *your* plant may reveal similar opportunities to turn dust losses into profits by removing dust (and *reclaiming* it, if it's valuable) from light-stealing, efficiency-reducing, maintenance-increasing dust pockets. Such a survey — by experienced Pangborn engineers — costs nothing. And ask for free 28-page Bulletin 909A, giving complete story on Pangborn equipment which has successfully solved dust problems in over 9000 installations. Address Pangborn, *world's largest manufacturer of dust control and blast cleaning equipment* at 300 Pangborn Boulevard, Hagerstown, Maryland.

Pangborn
DUST CONTROL
PANGBORN CORPORATION, HAGERSTOWN, MARYLAND

TURNS DUST LOSSES INTO PROFITS

MEET THE *New* ROTOR SCALER

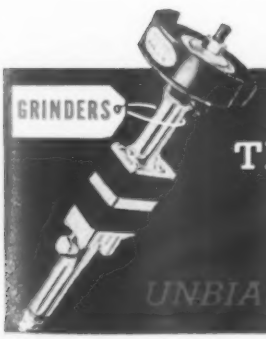
Here is a rugged little 3 pounder with a heavyweight wallop . . . the Rotor S-1 Scaler. Try it on these *production and maintenance jobs:*

Weld slag removal • Spatter cleaning • Weld peening • Rust or paint scaling • Star drilling • Light chipping •

See how it *cuts your costs.*

Call in the Rotor Analyst to demonstrate the new Rotor Scaler on your work. See how easy the operator can control the blow . . . how its swivel head allows flexibility in handling and its positive chisel retainer assures safe operation and fast work in tight corners. Ask for free copy of Bulletin 33.

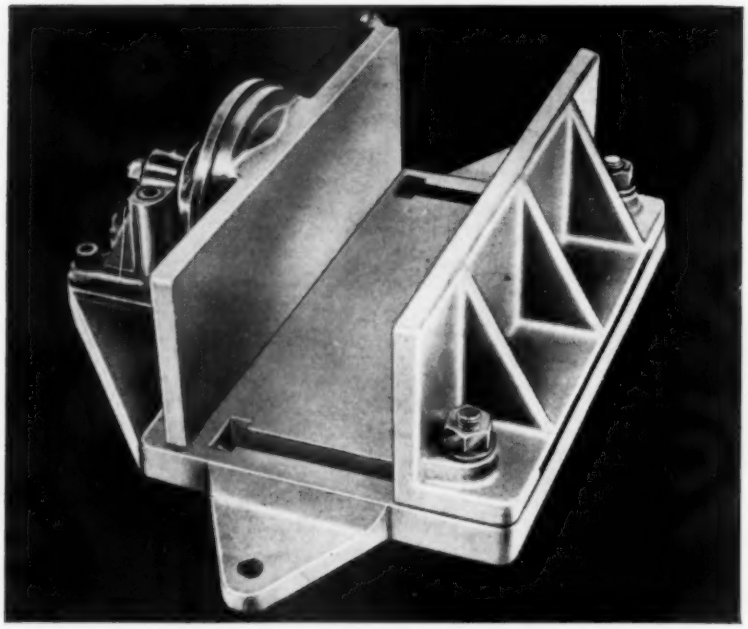
AIR O'TOOL



THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



*Lehigh-*MARTON *Air-Controlled*

CORE BOX VISE

FOR USE IN ALL VERTICAL SPLIT BOX TYPE BENCH CORE MAKING

PROVEN IN OUR OWN FOUNDRY

- ☆ *FAST ACTING, FOOT CONTROLLED*
- ☆ *QUICKLY ADJUSTABLE FOR BOXES UP TO 5" WIDE, 20" LONG, 7" HIGH*

The Lehigh-MARTON Air-Controlled CORE BOX VISE was designed by our own engineering department to speed production and to reduce to the greatest possible extent the time consuming and costly delays caused by core box repairs. Experience, covering a long period of time, has shown that this vise has reduced core box repair cost and problems by a full 50% while increasing production, in both hand-rammed and blown cores, up to 100%.

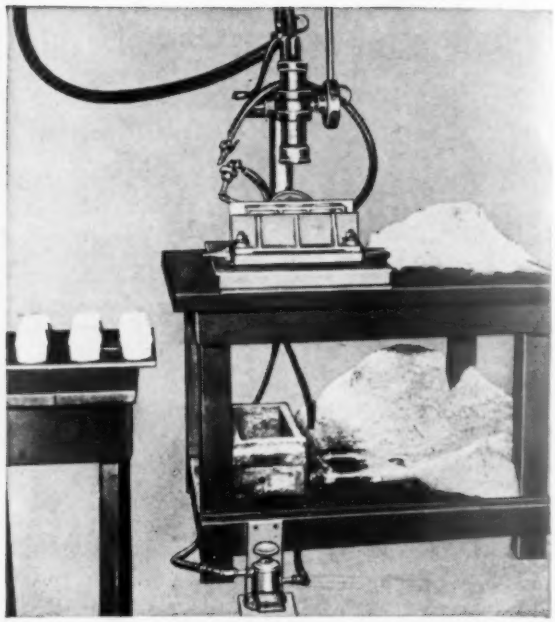
Quickly Repays Cost

Close check of operation costs in our own foundry has shown that on one job alone the cost of the vise was more than saved in 30 days of operation.

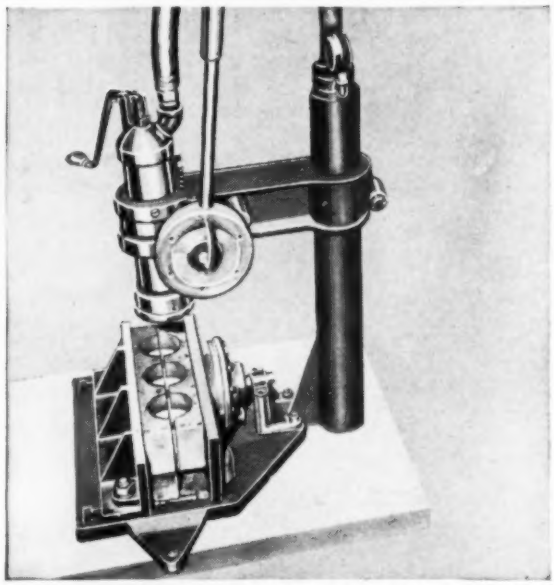
PRICE **$93.50** COMPLETE WITH VALVE

IMMEDIATE DELIVERY

MARTON AIR CONTROL DIVISION
Lehigh Foundries, Inc.
EASTON, PENNA.



VISE ON BLOWER SHOWING LEHIGH-MARTON AIR VALVE

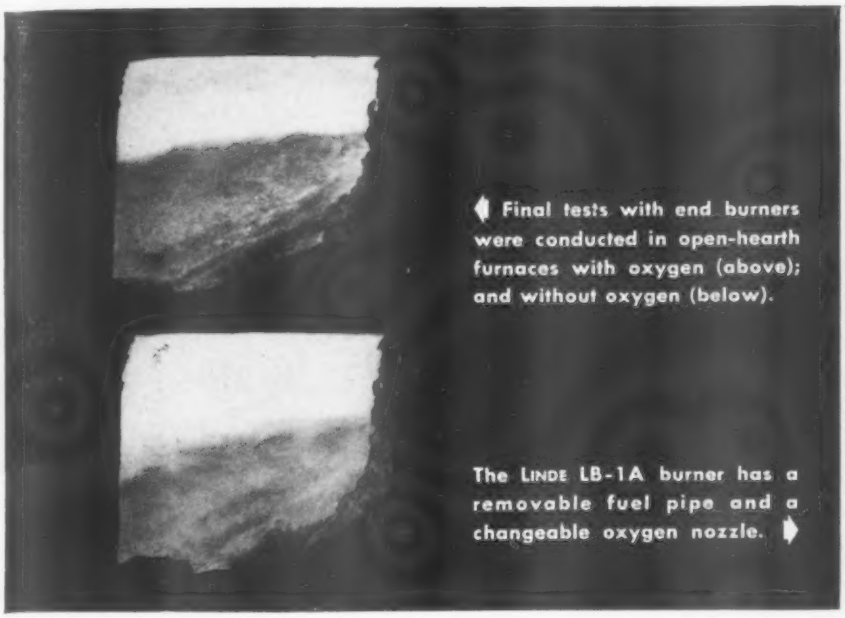


VISE IN OPEN POSITION ON BENCH BLOWER

VISE BEING USED FOR HAND OPERATION. ALSO USES LEHIGH-MARTON VALVE. NOTE SAND PILED OVER DIAPHRAGM

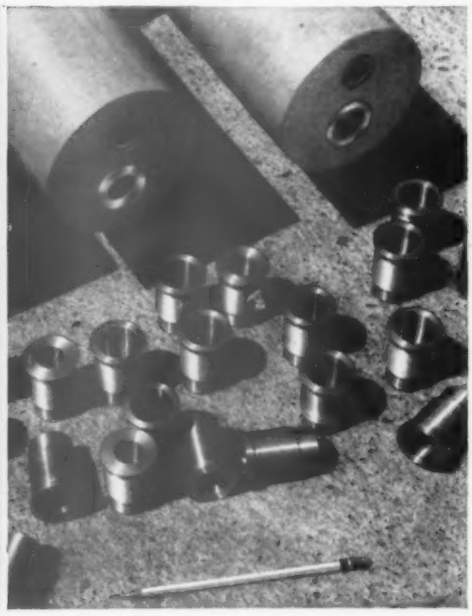
What's the Story on Oxygen in Steel-Making Furnaces? No. 4 of a Series

No. 1 was a General Review
No. 2 was on Decarburization
No. 3 was on Direct Scrap Melt-Down



Final tests with end burners were conducted in open-hearth furnaces with oxygen (above); and without oxygen (below).

The LINDE LB-1A burner has a removable fuel pipe and a changeable oxygen nozzle.



More Heat for Scrap Melting

MELT-DOWN TIME CAN BE REDUCED APPRECIABLY when oxygen is used in end-burner flames. This has been shown by the data on literally hundreds of the more than 7,500 heats on all phases of oxygen use in 34 furnace shops with which LINDE has co-operated. Increased heat input for scrap melting is obtained by introducing an oxygen stream beneath the fuel stream. Yet there is no increase in volume of combustion gases. This is particularly important in old furnaces with insufficient checker capacity.

LINDE burner developments have demonstrated the advantages of the undershot oxygen stream. This produces a much hotter flame than the conventional air-fuel burner. The oxygen-fuel flame is hottest on the underside. The upper part of the flame, near the roof, is no hotter than that produced by the conventional burner.

The design of the undershot burner is the result of many tests. Burners were designed to produce long thin flames and wide flat flames. Some were tested in full-size furnaces as end burners, others as auxiliary burners inserted through the back wall and roof.

Research on end burners is, of course, only one phase of LINDE's program. The goal is to find the most effective methods for using oxygen in steel-making furnaces. Already this effort has resulted in a significant reduction in cubic feet of oxygen required per ton of steel to accomplish the desired production increase. In co-operation with steelmakers, LINDE will continue to explore all phases of oxygen use and report its findings as knowledge is gained.

Management and production executives are invited to write for a copy of the factual report which LINDE *has prepared on oxygen use in steel-making furnaces. This report also explains the* DRIOX *high-purity liquid oxygen system and* LINDE's *work on low-purity gaseous oxygen. Please address Room 308, 30 East 42nd Street, New York 17, N. Y.*

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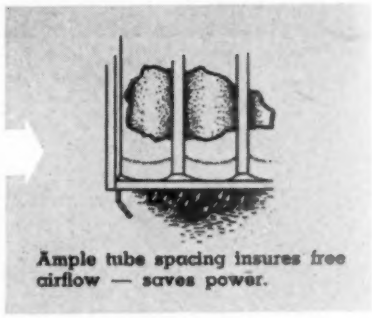
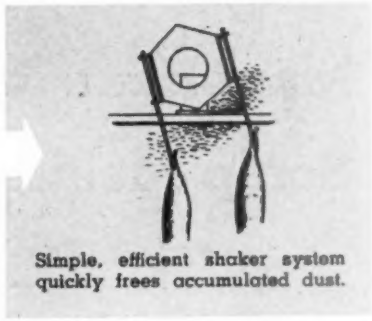


Ample tube spacing insures free airflow — saves power.



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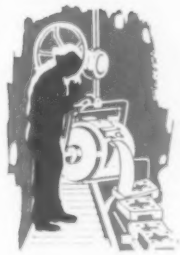
DUST COLLECTORS

CASTING DEVELOPMENTS IN REVIEW



BELIEVING that industry benefits greatly from periodic reviews of progress within the field, the editors of THE FOUNDRY asked five authorities on casting production to discuss important trends since the end of the war in their respective branches. These timely and valuable contributions to the literature of the industry are presented on the following pages and should be of considerable interest to all foundrymen.

Briefly, what have been the important developments in that period? First, foundries have made considerable technical progress, partly reflecting application of wartime technical advancements. New knowledge, in many instances the product of co-operative research, has brought about more sensitive production controls and has permitted the manufacture of higher quality castings meeting every requirement of the applications for which they were designed. Because the industry recognizes the need for constantly improving practice and product, research probably will receive even greater attention in the future.

Tremendous progress in modernization and mechanization of foundries is the second important development. Lack of an adequate labor supply which has been carried over from the war years, rising labor costs which demand production economies made possible only by the machine, and the desire of management to provide better plants in which to produce castings, have been important factors influencing the modernization trend. While much has been accomplished, even more remains to be done if better housekeeping and further production economies are to extend throughout the industry.

Growth of co-operative efforts in the building of a greater foundry industry is the third major development. Trade, technical and management associations have enlarged their activities to provide even a broader range of services to members. The Foundry Educational Foundation has been organized with the GIFS, MFS, AFA and FEMA as founding members, and has raised in excess of $280,000 by voluntary contributions to sponsor a training program for foundry engineers in six leading institutes and universities. After months of discussion, the eight associations serving the foundry industry on a national basis formed the National Castings Council to further serve the industry.

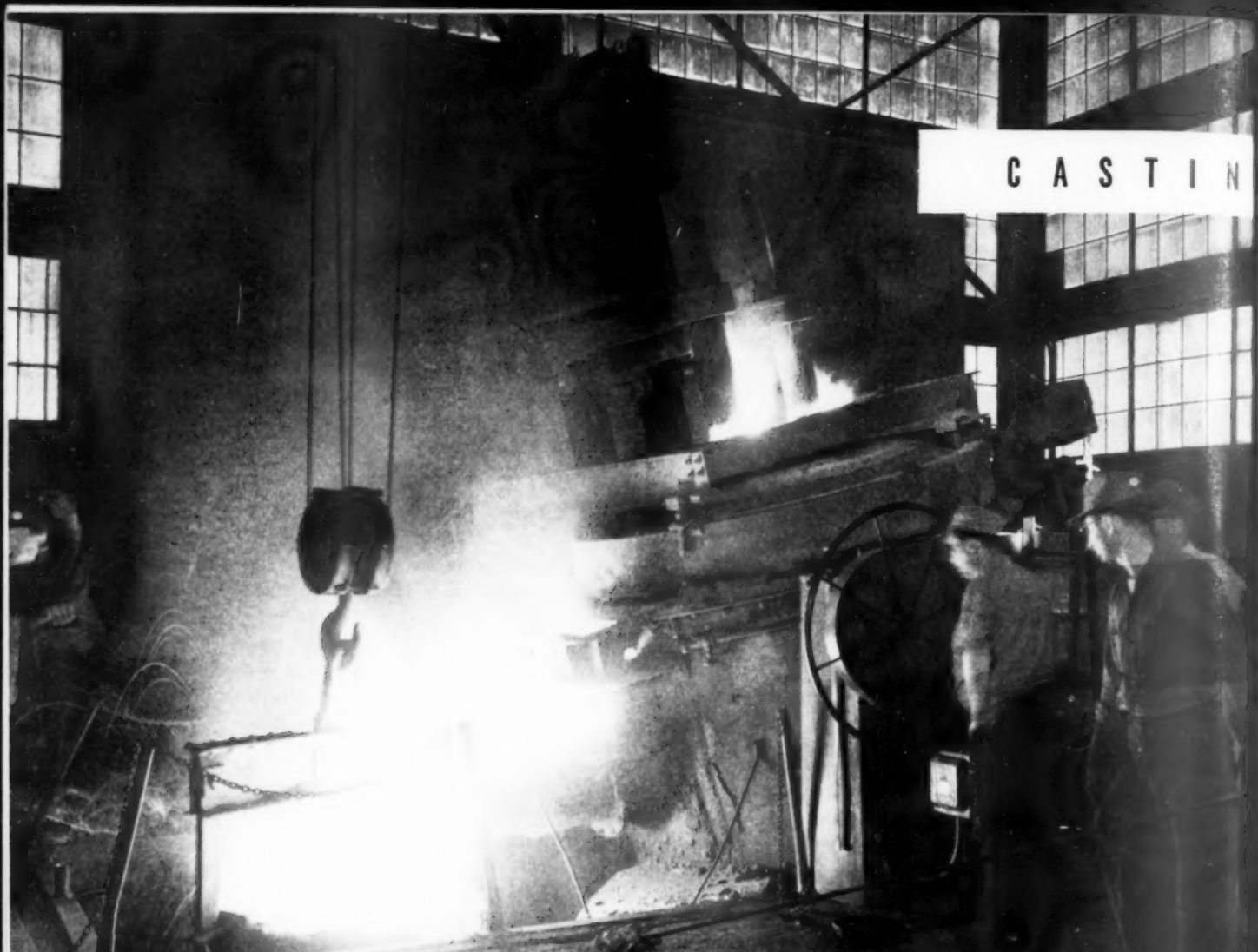
The foundry industry continues to move forward in many ways. As indicated in these reviews, shortages of metallics and other raw materials have been the most pressing problem in recent months, and probably will be even more critical in the months ahead. But if foundrymen can exhibit the same ingenuity and dogged determination to do a job as has been displayed during the past seven years under the most trying conditions, needs of American industry for castings—the basic engineering materials—will be met.

And may it be a Happy and Prosperous New Year for foundrymen everywhere!

Frank G. Steinbach

EDITOR

THE FOUNDRY—
WHERE PRODUCTION AREA LAST



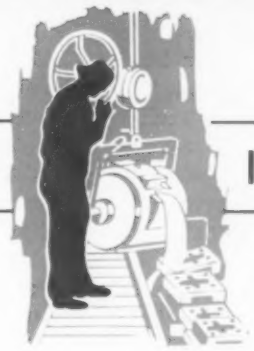
Steel

By CHARLES W. BRIGGS
Technical and Research Director
Steel Founders' Society of America
Cleveland

THE very favorable position created by the steel casting industry during the war years through a step-by-step building of quality controls has not diminished during the last two years of peacetime production. In fact, the release of pressure resulting from quantity demands has resulted in more attention to casting quality and technical developments.

Casting production has, of course, dropped off from the war peak and the products have swung back to the usual peacetime castings for the following major industries: Railroad and transportation, machinery and tools, rolling mills, materials handling equipment, valves and fittings and road and building construction. Shortages of one type or another have been instrumental in lowering the rate of production. Early in 1946 there was an acute shortage of pattern grades of lumber, and a serious shortage of corn cereal binder developed around the middle of the year. It was not until late fall, when a bumper corn harvest started to reach the market, that the threat to production resulting from the shortage of corn binder finally disappeared.

The latter half of 1946 saw progressive deterioration in the amount of steel scrap available in the free market. This shortage became gradually more



acute during 1947 with the market being erratic and with prices rising. Other shortages and threatened shortages during 1946 included a scarcity of core oil and maldistribution of stocks of foundry nails. The steel strike which occurred early in 1946 affected the steel casting industry and was responsible for a considerable drop off in production.

It is planned to review in the remainder of this article the major technical developments and progress in operation methods that have taken place in the last two years. Instead of discussing the subject chronologically it will be considered according to operation topics.

Steel Making—Fast melting methods have always been considered of importance in the steel casting industry; thus, a re-study of these methods with emphasis on new developments was important. In the electric furnace operation the development of the rotating type automatic electrode control has permitted accurate control of electric current to obtain efficient furnace operation whereby the regularity of the arc is maintained at all times. Records have clearly indicated savings in melting time and power.[1] The method of preparation and charging of scrap and the power control are items that require close control if fast melting conditions are to be secured.

Much thought and effort have been given to the preparation of silicon-killed steel in the acid electric practice with little or no aluminum used for deoxidation because of the susceptibility of steels to graphitization in the presence of substantial amounts of aluminum.[2] Aluminum is usually added to insure dead killed steels for green sand molds. A practice is required which will keep the hydrogen content low in the steel as poured into the molds. Recent studies by the Steel Founders' Society at Battelle Memorial Institute show that hydrogen to an amount of 0.30 relative volume or more is commonly present in commercial steels in the ladle. This quantity of hydrogen can be reduced during steel making by maintaining a strong boil, normally one of sufficient activity to reduce carbon at rates of 0.40 to 1.0 per cent per hour. In this effort, the acid arc furnace seems most amenable to control while the basic open-hearth furnace offers the greatest resistance to effective modification of practice. To preserve the effect of hydrogen reduction during steel making, it is necessary to strictly limit the time spent in an inactive condition after boiling and to insure that the ladle refractories are thoroughly dry.

Emphasis has been placed on the importance of sulphur in steel made by both the acid and basic electric methods and basic open-hearth practice.[1,2,3] Methods of possible control of sulphur in the acid electric practice are (1) the Perrin process, (2) triplex process, (3) use of spodumene and lithium, (4) use of sodium and (5) by the addition of selenium. In the last case the sulphur is not eliminated from the bath but is combined with selenium to form early-freezing inclusions which do not have a harmful effect on the ductility properties of steel. It has been suggested that 0.05 per cent selenium be added in conjunction with 0.05 per cent calcium to secure good results.[4]

Much has been written concerning the use of oxygen in open-hearth and electric furnace operations to speed up melting operations and lower fuel costs. Information on the production methods to use are now becoming available. The first studies were made in connection with the open-hearth furnace but, of late, a number of electric furnace operators are using oxygen in making production heats. It is an excellent way of reducing carbon content in high-alloy steel to a very low figure.

A number of reviews of the converter practice in steel foundries have been published.[5,6] The various wartime operations were covered both as to American and British practices. Outstanding developments were increased converter lining life and the production of large alloy heats through the tapping of several consecutive blows.

Studies on the various methods of deoxidation of

Fig. 1—Renewed interest being shown by steel foundries in core blowing is an outstanding development of the last few years in sand practice

cast steels and their effect on the notched bar impact properties of these steels were conducted by the Steel Founders' Society at Case Institute of Technology. These studies showed that of the seven methods of deoxidation, the one producing a residual aluminum content of 0.02 to 0.04 per cent gave the highest notched-bar impact properties at normal and low (-185° F) temperatures.

Molds, Sands and Cores—Interest was created during wartime in the use of plastics for the preparation of patterns. With the change over to peacetime production and the necessity for producing new sets of patterns, many steel foundries found that production patterns could be reproduced quickly and cheaply by the use of plastics.[7] A number of foundries are installing their own equipment to produce plastic patterns.

The most interesting development in the field of sands and cores is the renewed interest taken by steel foundries in core blowing. The principles, methods, advantages and limitations of core blowing have been carefully reviewed and studied; many operational problems in core blowing have been discussed at meetings of the Steel Founders' Society. It was learned that the Germans used core blowing extensively during the war even though as a whole their foundries were not too well mechanized and they had few oil sands to blow.[8]

It is believed that changes are being made in the operations of most foundries so that one or more core blowers will be used in every steel foundry in the near future.

The steel casting industry is looking with interest at the recent developments in the binding of cores with synthetic resins and in the baking of cores dielectrically.[9,10] While dielectric baking has not been adopted in production by the steel foundries, as yet, because of equipment requirements, synthetic resins are being used with considerable success. Also, the chemically-coated molding sands being used for gray iron[11] are being studied to see if they are applicable to steel molding.

A few new tests have been reported for the testing of molding sands during the last two years. The most important of these is the use of the AFA test specimen, dipped into molten steel for various time periods. It appears at present that this test tells more than any other developed test concerning the behavior of molding sands when in contact with molten steel, especially as to the possibility of the sand scabbing and permitting metal penetration. Practical tests have been developed for the determination of the moisture content of foundry sands. The methods proposed will assist foundrymen to readily and quickly obtain the moisture content of heap sand throughout the shop.

Further study of the molding sand fineness test[14] has resulted in changes in the reporting of sand fineness which will tend to make this test of more practical use to steel foundrymen. Also, tests have been provided for determining the properties of core-binding materials.[15] These tests can be used by both the foundryman and the supplier of binding materials so that the quality and uniformity of these materials can be maintained and checked.

An interesting development has been the very practical study of operation methods regarding the venting of molds. It has been shown[16] that considerable time and cleaning costs can be saved by the use of fewer vents. Many foundries have adopted this practice to such an extent that a large majority of molds are no longer vented, as it has been found that quality of the casting was not affected.

Studies have been continually going forward on sand reclamation methods and equipment and complete information on sand systems and their maintenance as well as the quality of the sand obtained from the various reclamation methods are continued subjects of discussion before meetings of the Steel Founders' Society.[17]

The precision casting method of molding has been reviewed extensively during the last two years. This review has presented wartime developments and present day information (*Please turn to Page* 183)

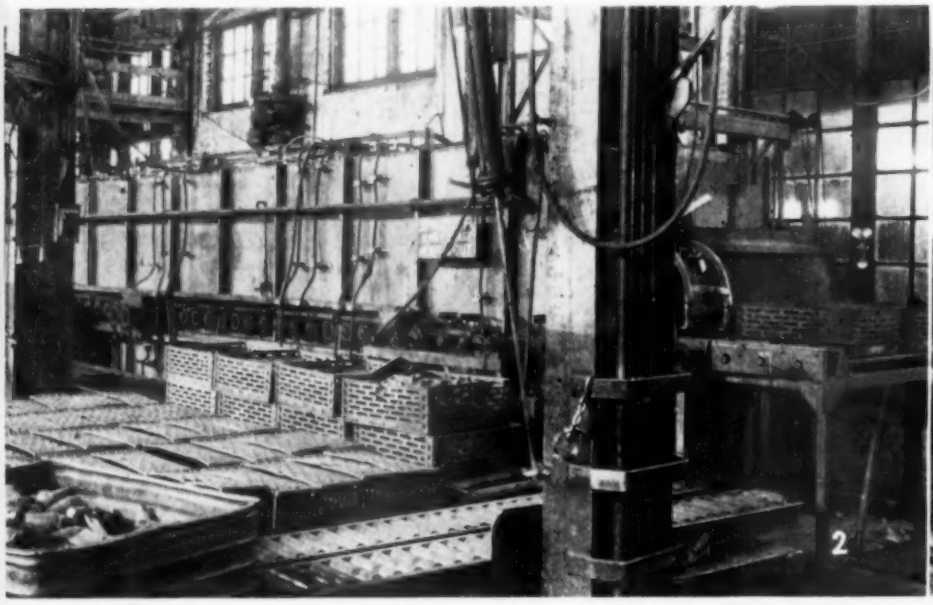


Fig. 2—Continuous heat treating furnace. Considerable information has been developed the last two years on various types of casting treatment

Fig. 3—Magnetic particle inspection of a steel casting. Effective use of this method has been carefully studied by the industry in recent years

Fig. 4—Use of standard cutting torch with flame gouging tip in excavation of unfused chills

Fig. 5—Gear casting made with three necked-down blind risers and one open riser. Universal use of necked-down risers has been of considerable assistance in speeding production of steel castings

Aluminum

By WALTER E. SICHA
Research Metallurgist
Cleveland Research Division
Aluminum Research Laboratories
Aluminum Co. of America

Fig. 1 — Rear axle and differential housing of aluminum alloy castings for heavy duty trucks

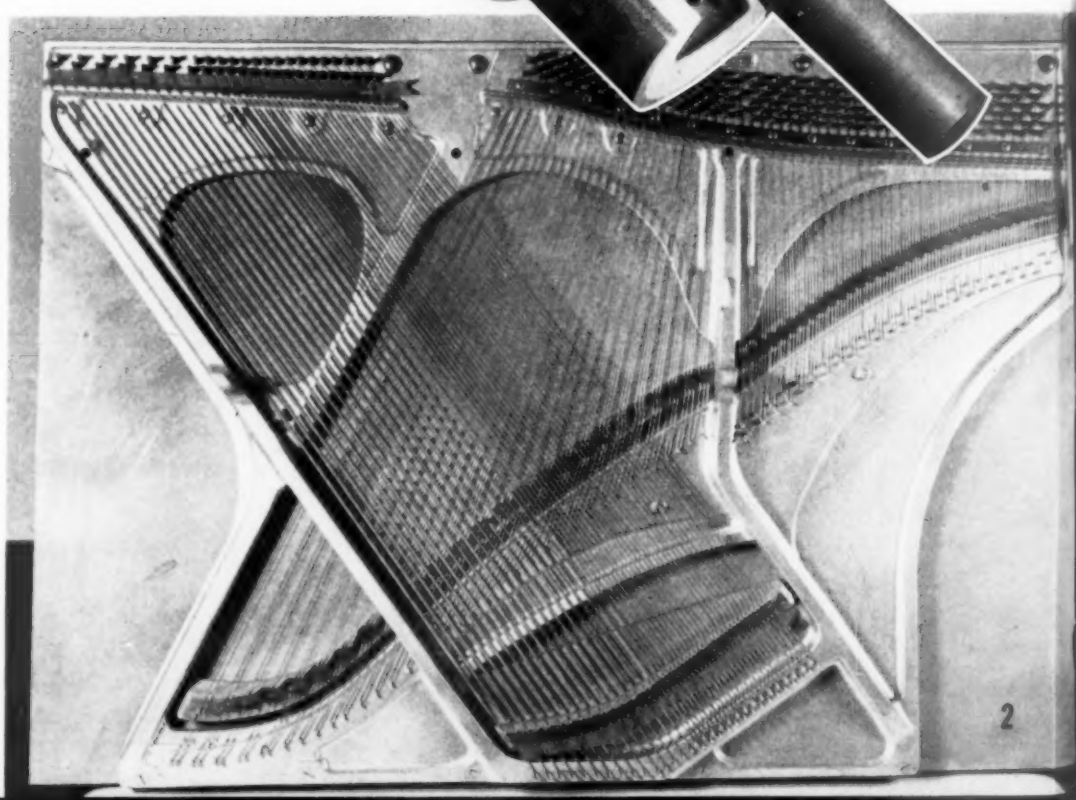


Fig. 2 — Cast aluminum alloy spinet piano plate, strung and mounted on sounding board

Fig. 3 — Permanent mold cast and fully machined aluminum alloy bearings ranging from about 2 in. to 16 in. in diam.

Fig. 4 — Irrigation pipe line with cast aluminum alloy fittings and couplings

PROGRESS in the aluminum foundry industry in the little more than two-year period since V-J Day has stemmed largely from extension and improvement of known metallurgical information and foundry techniques rather than from revolutionary discoveries. Most of the developments in foundry practices were fostered by need for production cost reductions to meet increasingly competitive market conditions while maintaining or improving casting quality. These observations do not detract at all from the value and importance of the advances that have been made.

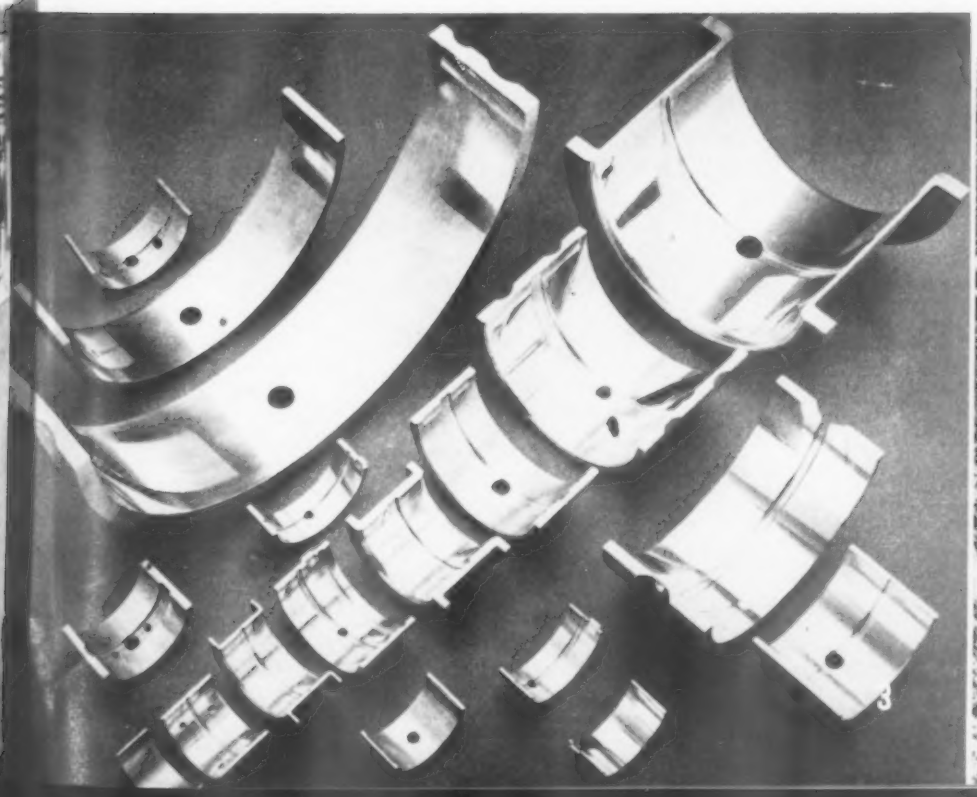
Production of aluminum alloy castings has continued at remarkably high levels since the end of the war. The significance of postwar casting shipment figures can be judged by comparing them with the 1939 peacetime production of about 7 million pounds per month and the 1944 wartime level of about 43 million pounds per month. Casting shipments dropped abruptly during the last six months of 1945, reaching a figure of about 18 million pounds in December which was still more than double the level of 1939. Shipments increased from about 23 to 29 million pounds per month in the period from January through July of 1946 and advanced to about 35 million pounds per month during the last five months of the year, attaining a peak of about 40 million pounds in October.

Data for 1947 show that casting shipments averaged about 38 million pounds per month from January through May, a level approaching that attained during the war. The reduction in output during June, July and August of 1947 to about 31 million pounds per month probably can be attributed principally to adjustment of casting inventories by finished product manufacturers. The increase to 36 million pounds in September indicates that when shipment figures are published for the last quarter of 1947, they will be higher than those of the preceding quarter. These sand, permanent mold and die casting shipment statistics were obtained from reports prepared by the Bureau of the Census, except for the 1939 figure which is an estimate based on the best available information.

Process Developments — The basic processes of sand, permanent mold and die casting continue to be the methods employed for a very high percentage of the aluminum alloy casting production. General gains have been made through mechanical improvements in these casting processes. Interest in and use of aluminum alloys in the plaster mold and precision-investment casting processes continue in special purpose applications, although costs and some metallurgical limitations still restrict production volume. Some progress has been made in development of centrifugal casting process techniques during recent years.

One of the most impressive features of the centrifugal process is the fact that use of this method assists production of sound castings in alloys that do not have particularly good casting characteristics when used for production of sand or permanent mold castings. Further investigation of the centrifugal casting process probably will reveal that

CASTING DEVELOPMENTS IN REVIEW



certain parts are particularly suited to production by this method. Active study of this process is being conducted by the Committee on Centrifugal Castings of the AFA Aluminum and Magnesium Division.

Plastics selected especially for making patterns have been the subject of recent articles in technical magazines. A thermosetting phenolic casting resin has desirable characteristics as a material for production of patterns, and experiments have been made using certain thermoplastic synthetic resins for this purpose. While susceptible to final forming by most machining practices, heating a thermoplastic resin pattern in machining or sanding must be avoided. Use of plastics for patterns has not been extensive and apparently both types have been employed as a rule in production of patterns that can be cast in practically final form.

Foundry Practice Developments — The gating of sand and permanent mold castings always has been a universal foundry problem. Selection of gating systems suitable for production of castings of high quality, and which are at the same time adapted to economical production, has been performed generally on the basis of individually acquired and frequently bitter experience. A fundamental study of factors involved in good gating practice for castings has been initiated by the Research Committee of the AFA Aluminum and Magnesium Division. It is hoped and also believed that over a period of time this project will develop basic information which should assist foundrymen materially in gating aluminum alloy castings most effectively. Synthetic resins have been gaining acceptance as core sand binders for several reasons. Cores made with this type of binder in the sand mix can and should be baked at lower temperatures than those employed in baking oil-bonded cores. The retained strength of cores bonded with urea resin after use in casting production is

Fig. 5—Packaged and bare (center) cast aluminum alloy galvanic anodes

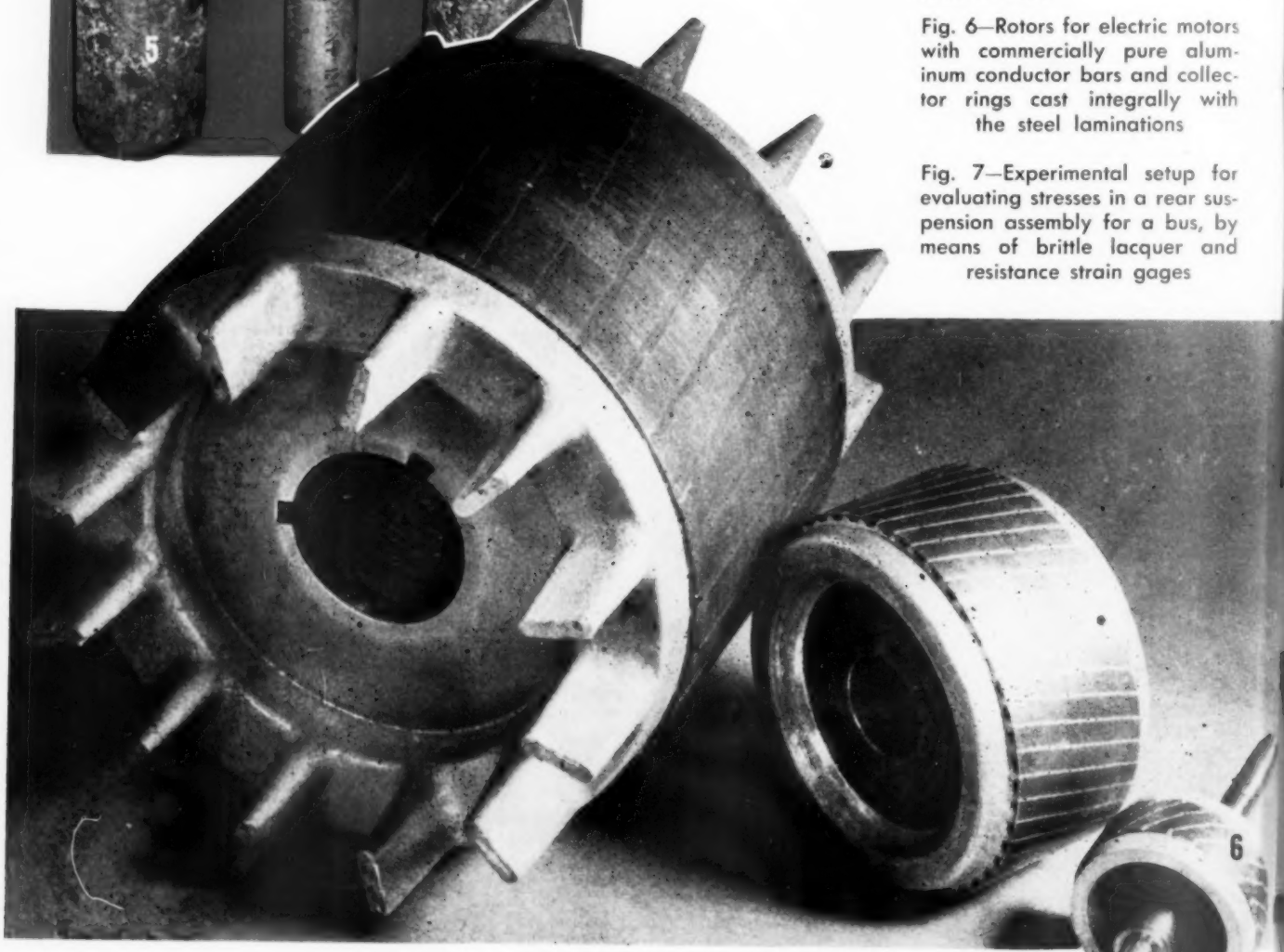


Fig. 6—Rotors for electric motors with commercially pure aluminum conductor bars and collector rings cast integrally with the steel laminations

Fig. 7—Experimental setup for evaluating stresses in a rear suspension assembly for a bus, by means of brittle lacquer and resistance strain gages

comparatively low and core knock out is easy and rapid.

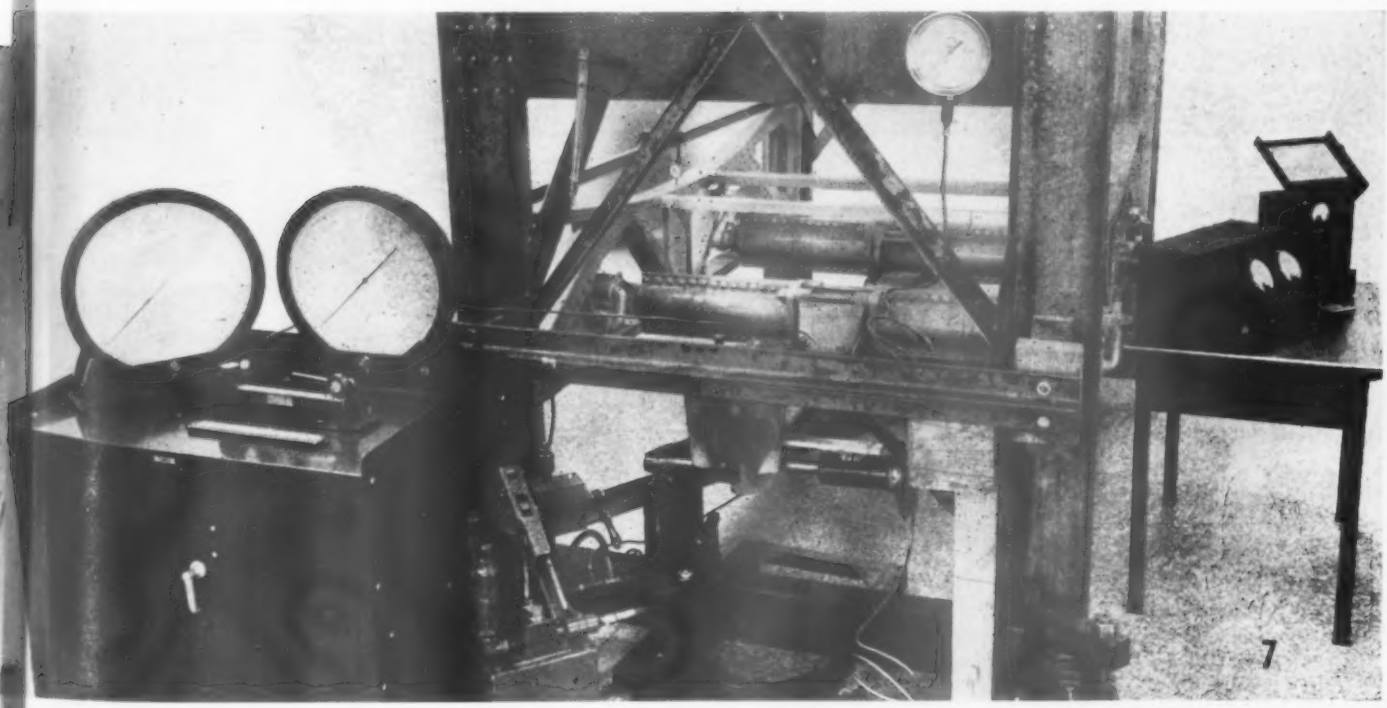
Dielectric heating for core baking has the attractive property of distributing the heat throughout the body of the core as opposed to conventional baking practices in which the heat supply is external to the core. The baking time cycle for cores made with a thermosetting core binder and using this method of heating is measured in seconds or minutes. This rapid baking is an advantage in meeting rush requirements encountered occasionally when core stocks become depleted. Disadvantages that have been encountered are the requirement of generally excluding steel core wires, inability to bake cores on metal driers and necessity for altering the dielectric unit electrode spacing and design for cores that vary materially in shape and size. It appears that dielectric units may prove to be useful in supplementing conventional core baking equipment.

Fuller realization has been gained recently of the merits of substituting more permeable and lower moisture content synthetic molding sands, in place of the fine-grained natural molding sands that have been used generally in the past, for producing aluminum alloy sand castings. The more open and drier sand is a valuable aid in reducing scrap attributable to casting defects caused by steam generated in the mold cavity through introduction of molten metal. Adoption of synthetic molding sand mixes also assists procurement of combinations of molding sand properties best suited to requirements established by size and design of castings being produced. Somewhat rougher casting surfaces and need for more carefully controlled reconditioning are the principal disadvantages of synthetic molding sand but they should be much more than offset by the advantages. The chemically coated molding sand, which has excited so much interest through its use in some iron foundries, apparently warrants investigation to assess its value as an aluminum foundry molding sand.

Basis for a more thorough understanding of the effects of gas, more specifically hydrogen, in aluminum casting alloys has been provided by several excellent items published in about the last two years. Significance of this information can not be overemphasized, since the gas content of the molten metal has a far-reaching influence on casting problems and quality. Prevention of hydrogen pickup by avoiding introduction of moisture-carrying materials or tools into the molten metal has been stressed as an important aid in reducing porosity in castings poured from that metal. The merits of fluxing the molten metal with gases or salts for removal of hydrogen have been discussed in these articles. Some recently marketed salt fluxes have been recommended for the introduction of grain refining elements as lower cost materials than the aluminum-rich alloys that have been used for this purpose. Certain of these fluxes are intended to remove hydrogen and dross in conjunction with grain refining action.

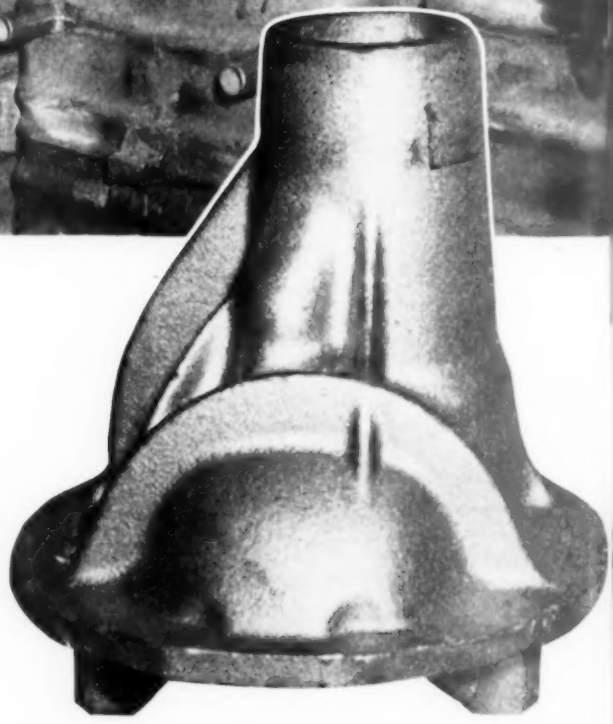
The comparatively high ratio of gate and riser weight to casting weight that has been considered as unavoidable in aluminum alloy casting production contributes in an undesirable manner to fabrication costs. Means for reducing the metal pouring ratio have been devised and descriptions have been provided of their application, particularly in iron, steel and brass foundries. Exothermic materials inserted in risers or placed at the base of risers constitute a method for riser volume reduction.

Formation of the exothermic material into a "core" to shape a short length of top risers, just above the casting, permitted marked reduction of the riser cross-sectional area in this zone. Such risers usually can be broken off, thereby reducing trimming time and cost. Some attention (*Please turn to page* 124)



Above—Pouring castings on a roller conveyor in a malleable iron foundry

Right—Typical automotive castings which account for a large tonnage of malleable iron



CASTING DEVELOPMENTS IN REVIEW

Malleable Iron

By JAMES H. LANSING
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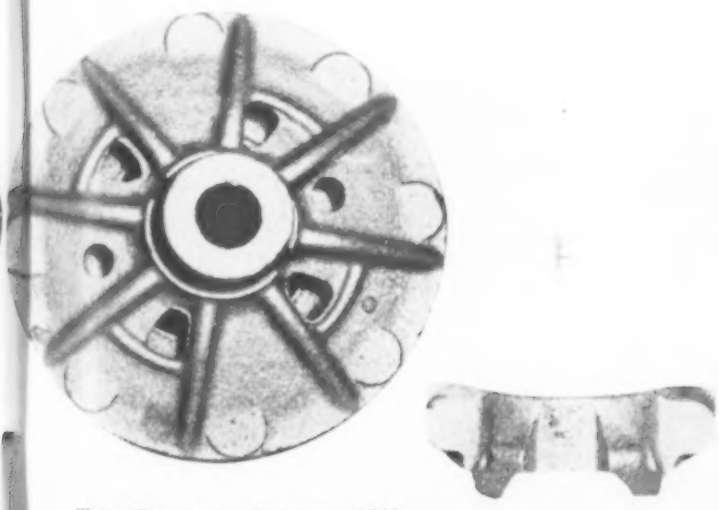
Malleable Founde.s' Society
Cleveland

THE last prewar year, 1941, was one of substantial malleable iron casting production, exceeding 1940, when malleable's place in the armament program was not fully realized, by approximately 50 per cent. During the war years of 1942-1945, the malleable industry maintained an average production of close to 900,000 tons annually. In the last war year, 1945, production was just over 850,000 tons, this being followed by an 800,000-ton year in 1946.

When the final malleable casting production figures for 1947 are available, they should show a rate of operation some 6 per cent higher than in 1945 and 12 per cent higher than in 1946. The 1947 production thus will have surpassed slightly that of 1941, the last prewar year.

Had adequate supplies of melting stock and fuel been available at all times, 1947 production would have been even greater. Pig iron, scrap, and coal and coke shortages, at some time caused loss of production in nearly every area. Sufficient production orders were always available but melting materials were at times lacking. It was also true in 1947 that the necessity of substituting additional scrap for a substantial part of the iron charge, often developed. This increased operating difficulties and costs, as compensation had to be made for differences in the amounts of various elements contained by the replaced materials.

When steel scrap replaces part of the pig iron of a furnace charge, ferroalloys must be added to provide the decreased silicon and manganese content, and petroleum coke or some other carbon raiser to equalize the carbon content. In a similar manner some adjustment must be made when malleable iron scrap is the replacement. Gray iron scrap normally contains amounts of silicon and carbon which are closest to those of the replaced pig iron. In the case of this scrap, however, the presence of substantial amounts of phosphorus prevents any large use of gray iron as a malleable melting component. High phosphorus content would materially reduce the serviceability of malleable iron in many of its applications.



As to new production facilities, two new malleable foundries now are in operation which were not in existence prior to the war. Offsetting their production, from the standpoint of capacity available to the custom trade, has been the acquisition by farm implement manufacturers of two foundries which formerly served a number of individual customers. These plants still contribute to the total malleable production but their field is, of course, restricted to the individual requirements of their owners. Overall capacity available to customers, however, has substantially increased, due to the installation and greater use of production equipment by the malleable foundry industry.

In plants of which the production is adapted to large and continuous operation, increased use of power conveyors and kindred equipment has helped place the industry in a better position to take care of the requirements of its large production customers. At the same time, the plants which customarily work on shorter production orders or produce castings not well adapted to conveyorized operations, have substantially improved their productive position. This has been accomplished, mainly, by the greatly increased use of improved material handling equipment and methods. Lift trucks, portable hoppers, shop power shovels, and equipment for handling molten metal as well as other materials, have been employed to marked advantage.

Operations have been facilitated in the annealing departments of many plants by the installation of equipment to expedite the work of packing and dumping or to speed the annealing operation itself. This equipment has done much to improve working conditions in malleable plant annealing departments. In fact, the same may be said of nearly all equipment installations made by the industry during the

past several years. Such have been planned with the dual purpose of facilitating production and improving working conditions in the plant. The results, especially in connection with annealing operations, have effectively accomplished the twofold purpose.

Plant and equipment improvements have not been confined to any one or two departments but have been quite general in scope. In the core departments increased use has been made both of large stationary core blowing machines and of the smaller portable type. Improved sand mixing machinery has also been installed in a substantial number of cases.

Yard equipment for the efficient handling of incoming materials has also been installed or augmented. Such equipment has included large electrically operated track cranes, gasoline motor-powered cranes and shovels, also equipment to speed the preparation, weighing and delivery of charges to the melting furnaces.

In the foundry proper, in addition to the use of power conveyors where such can be employed to advantage, molten metal distribution facilities have invariably been improved. These have taken the form of monorail conveyor ladles for distribution and, in many cases, for pouring as well. Some foundries employ lift trucks for transporting large ladles to various areas and others make advantageous use of buggy ladles. Effective use of lift trucks, shop boxes and self dumping hoppers is quite general for the handling of various materials in the foundry proper.

Handling Operations Given Attention

Attention has also been given to handling operations in the cleaning, grinding, inspection and finishing departments. Here cleaning equipment is invariably skip-hoist or hopper loaded, the discharge being by gravity into portable containers. Casting containers are quite generally lift-truck handled and delivered for grinding or other finishing operations at levels where operators may handle them with ease and dispatch. In many cases the gate removal operation is improved and abrasive materials saved by the use of shearing or milling operations.

In the shipping department it has also been possible to improve handling efficiency in many cases. Truck, or car-loading, pits have been installed or small loading conveyors employed. Some companies also ship in customers' shop boxes, easily handled by lift truck or on returnable pallets with the castings crate-supported.

Throughout all departments in many plants increased attention has been given to the importance of adequate lighting. Foundries which have investigated the subject agree with the Illuminating Engineering Society's Sub-Committee on Foundry Lighting that workmanship is improved, and both rejections and employee fatigue reduced, by providing illumination which is adequate for the required operations. In most cases, the employee response to improved visibility conditions is gratifying.

Malleable metallurgical operations have not changed greatly since the war. As indicated earlier, pig iron shortages have at times necessitated the increased use of scrap, with attendant problems requiring closer and more constant control. Also, due to the short supply of pig iron it is often true that pig iron of the desired analysis is not available. In such cases it may be necessary to produce metal with certain elements closer to permissible minimum or maximum limits than is desired. However, this has generally been satisfactorily controlled in the industry. Some increased use of duplex melting has developed in plants of which the production is adapted to continuous operation and which, with power conveyor installation, require a steady flow of metal throughout the day.

In the second malleable metallurgical operation, the anneal, some increased use has been made of gas-fired, radiant tube and electrically heated furnaces. Local gas and electrical energy rates are factors affecting increased use of these types of equipment. The question of whether the castings customarily produced are of a type which require packing material support during the anneal, is also of importance in determining what type of equipment may be used to advantage. The use of gas or electrically heated ovens results in a substantial reduction in the total time required for the anneal. One company has made use of circulating fans within a pulverized coal-fired periodic type oven, also employing cooling coils to accelerate the temperature drop from the first to the second stage of the anneal. The fans have been effective in developing a uniform temperature throughout the oven and, combined with the use of cooling coils, have resulted in a 33 1/3 per cent drop in annealing cycle time requirement in the plant in question. Similar installations have been made in a number of other plants.

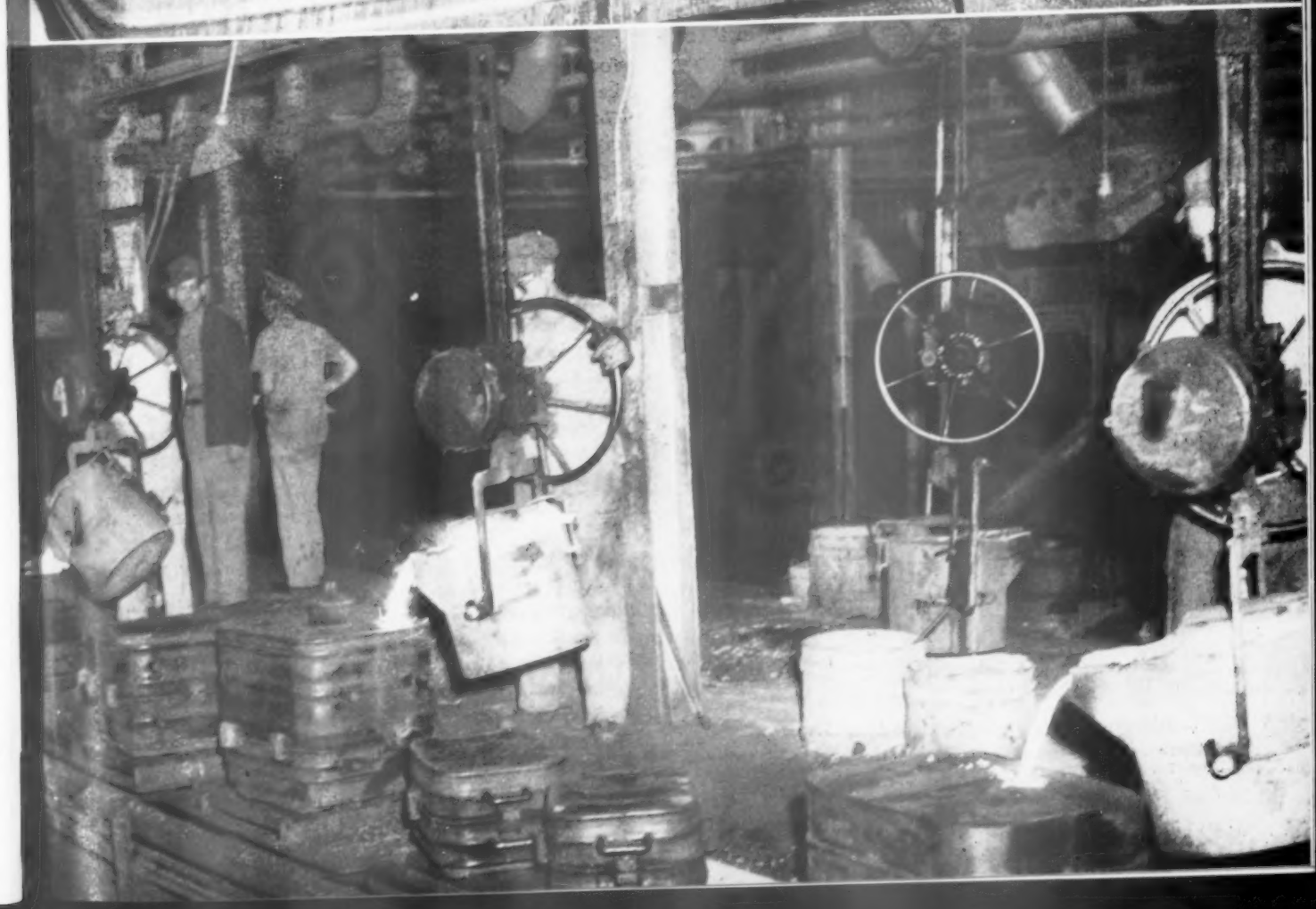
Right—Handling of work has been given special attention in finishing departments

Below—Increased use of equipment for handling molten metal and molds also has helped to improve malleable foundry operations

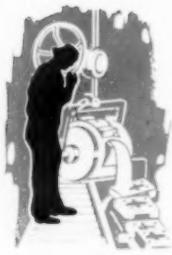
(All photos courtesy Dayton Malleable Iron Co., Dayton, O.)

That the use of malleable iron castings is as great in a civilian, as in a wartime economy, is demonstrated by the high level at which the industry has been operating since the war. The most substantial use now, as during the war, is in automotive vehicles including trucks and tractors. Malleable castings possess the toughness and resistance to shock to enable them to stand up in severe service. Their castability permits their production in close to the required final form and the ease with which they may be machined permits the economical production of the final required part or assembly.

Agricultural implement and railroad use is next greatest to automotive, with pipe fittings, conveyor equipment, and electrical fittings, following in order. Typical of large automotive use and of current applications, are the castings shown in the accompanying illustration. They form part of the present scheduled production which, augmented by new requirements, should keep the malleable industry operating at an excellent percentage of its capacity in 1948.



CASTING DEVELOPMENTS IN REVIEW



Brass and Bronze

By WALTER W. EDENS
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SINCE the end of World War II the brass and bronze foundries have converted to peacetime production with a minimum amount of physical plant change, but the emphasis has continued to be on quality and efficiency. Initially, as with other industries, these foundries were caught between rising costs and OPA ceilings, which somewhat stifled the normal development since every effort and attention was focused on production costs.

The metal conservation chart and conservation restrictions issued by the War Production Board in 1943, which effectively conserved copper and tin, has given away to normal economic and engineering requirements in the choice of alloys for various uses. The old standard alloys such as 85-5-5-5, 80-10-10, 88-10-2 and variations thereof, once again account for the bulk of the tonnage poured in brass and bronze foundries. Although most of the tonnage is in these standard alloys, there is a growing use of specialized engineering alloys such as beryllium copper, high conducting alloys, etc. for specialized applications. The extensive production and use of manganese bronze, which probably was one of the outstanding metallurgical developments of the war, has completely reversed itself, and the use of manganese bronze since the war has fallen back to its comparative volume before the war with one exception. Manganese bronze has continued to be used as a substitute for malleable iron, particularly in small castings. While in many cases this substitution has come about due to the limited supply of malleable castings, particularly in some areas, the success of the substitution in terms of cost, quality, and performance indicates that in many cases this "substitution" bids well to become a permanent one.

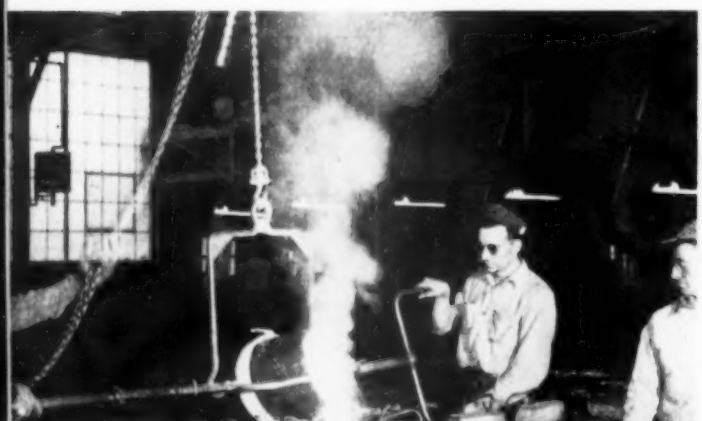


Fig. 1—Pouring molds for brass castings on roller conveyor in a modern nonferrous foundry

Contrary to the decrease in the use of manganese bronze, the aluminum bronzes are continuing to be used in considerably greater relative volume than before the war. This family of alloys can and should be used in many places where tradition has called for some of the tin bronzes. They do not contain expensive and still critical tin, and are 10 to 15 per cent lighter in weight than the bronze alloys previously used. Depending upon the intended application, the alloys will range from 8 to 15 per cent aluminum, 1 to 5 per cent iron, with copper as the base metal. Sometimes nickel in the range of 2 to 5 per cent and manganese up to 3 per cent are incorporated in the alloys for specific purposes. The experience gained by many engineers, designers and production men in the use and performance of these alloys during World War II has caused the postwar usage of these alloys to continue at a much greater volume than relative prewar levels.

The brass and bronze foundries of today are probably as well or better equipped in all phases of their operations than at any time in the history of the industry. The selective obsolescence of old equipment, where it existed, in the transition from wartime volume to peacetime volume, has been a major factor. Of no less importance has been the continued addition of new equipment to help close the gap between rising costs and competitive selling prices. Few if any of the brass and bronze foundries, except for some of the larger captive shops, are truly fully mechanized, but practically all of the progressive

Fig. 2—Centrifugal casting of copper-base alloys has continued to grow in scope and usefulness. The machine shown here produces castings of 8 to 14 in. OD and up to 200 in. long

jobbing units have or are presently adding equipment calculated to increase production, reduce costs and improve quality.

During World War II the brass and bronze foundries poured a large number of test bars in the course of inspection of their product for the war effort. It was, of course, necessary to have proper operational techniques, but good housekeeping, proper back scrap segregation, and the use of certified metals became as important as actual technical foundry practice. This requirement for test bars and subsequent physical and chemical tests on all heats has disappeared except in isolated instances; however, the practices adopted to control analysis and physical properties have been retained with good effect. Many of the foundries have their own laboratory facilities or systematically use the services of a commercial laboratory to check and control their quality.

In the two years since V-J Day some of the newer production methods, such as precision casting and centrifugal casting, have continued to be refined and improved. In fact, these two years reflect a consolidation of the gains made in techniques under the stress and strain of war production, rather than the extensive development of additional new methods. Centrifugal casting in particular has continued to grow in scope and usefulness.

There has been no radical departure in melting equipment inasmuch as both oil and gas fired crucible furnaces, indirect-arc electric furnaces, and some induction furnaces constitute the bulk of the melting equipment as they did before and during the war periods. A new open-flame gas or oil fired furnace, which might be called a small reverberatory furnace, with capacities ranging from 400 to 2000 lb, has been introduced and is finding favor among foundrymen in the industry. Its use is largely restricted to the melting of the red brass alloys, since the loss of zinc in the yellow alloys and manganese bronze is pro-

Fig. 3—Drawing a crucible filled with molten bronze from a pit furnace

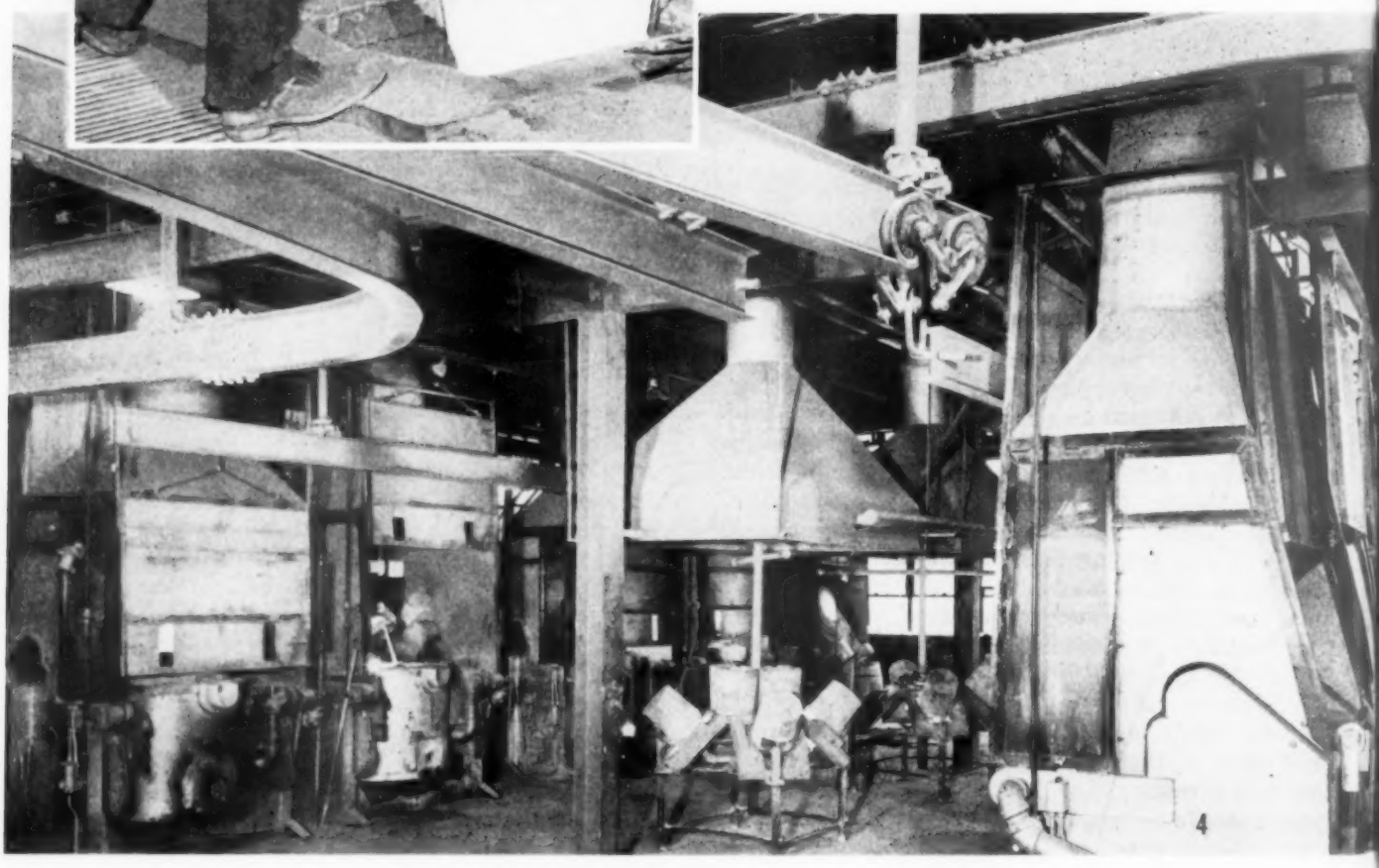
Fig. 4—Tilting type crucible furnaces equipped with exhaust hoods. This equipment makes for good housekeeping in the melting department

Fig. 5—Roller conveyors leading from molding stations in a brass foundry. Molding machines are served by overhead sand hoppers

hibitive. It has also been reported as doing an excellent job of melting the nickel silver alloys, which are melted to much higher temperatures than brass or bronze alloys. Its speed of melting is remarkable, being able, for example, to melt a 600-lb charge of red brass to pouring temperature in approximately 25 minutes. The production of 11 or 12 heats from a cold start in eight hours, including pouring off time, is not uncommon using this furnace.

Metallurgically, a lot of attention has and is being focused on melting practice and gas reactions in copper-base alloys. A review of the brass and bronze literature published in the last two years confirms this statement. Although there has been comparatively little change in physical equipment for melting brass, either as to size or type, the melting procedures have received considerable attention along with the effect of pouring temperatures, mold atmospheres, etc.

The casting defect genetically called "gas porosity"



has long been one serious cause of scrap to the brass and bronze foundry. A great deal has been written on this subject in past years and much valuable research was done, but the problem persists. The problem of fully evaluating the quality of a heat of metal has been fundamental to all research in this field, and the more or less standard test bars specified in inspection procedures were pretty well proved to be inadequate in evaluating this type of defect.

This and other corollary problems has led the Non-Ferrous Ingot Metal Institute to sponsor a research project at Battelle Memorial Institute under the direction of Dr. L. W. Eastwood on 85-5-5-5 composition test bars and gas porosity. The first report on this project was presented as the 1946 Foundation Lecture of the American Foundrymen's Association by Dr. C. H. Clamer. This lecture was published in two parts in THE FOUNDRY, Vol. 74, September, 1946, and October, 1946. This and subsequent reports by Dr. Eastwood, covering the evaluation of 11 test bar designs, 8 of which were investigated in detail as to the effects of pouring temperature, height, speed of pouring, mold tilt, permeability, and moisture content of the sand, have been the source of much information to the foundryman. This project is continuing and out of it is expected to develop many of the answers to this problem of gas porosity, micro shrinkage, etc., as experienced in brass and bronze foundries.

Other research on melting problems has been going on and much of this excellent work has been reported in the literature. The Brass and Bronze Division of the American Foundrymen's Association has recently undertaken to sponsor a research project relating to studies of fracture tests to see whether or not a suitable test can be developed which will help the foundryman to better evaluate the quality of his metal before pouring his castings. All of these projects and research studies have and will be a very valuable contribution to the brass and bronze foundry art and point the way to the economies of less scrap and improved quality.

To summarize briefly, the two years plus since the war ended have not wrought any major or drastic changes in copper-base alloy foundries. Rather, it has been two years of adjusting to a more normal peacetime production. Undoubtedly, the shortages of steel and other ferrous products has had its effect on brass and bronze volume, however the principal developments and highlights of these two years seem to be:

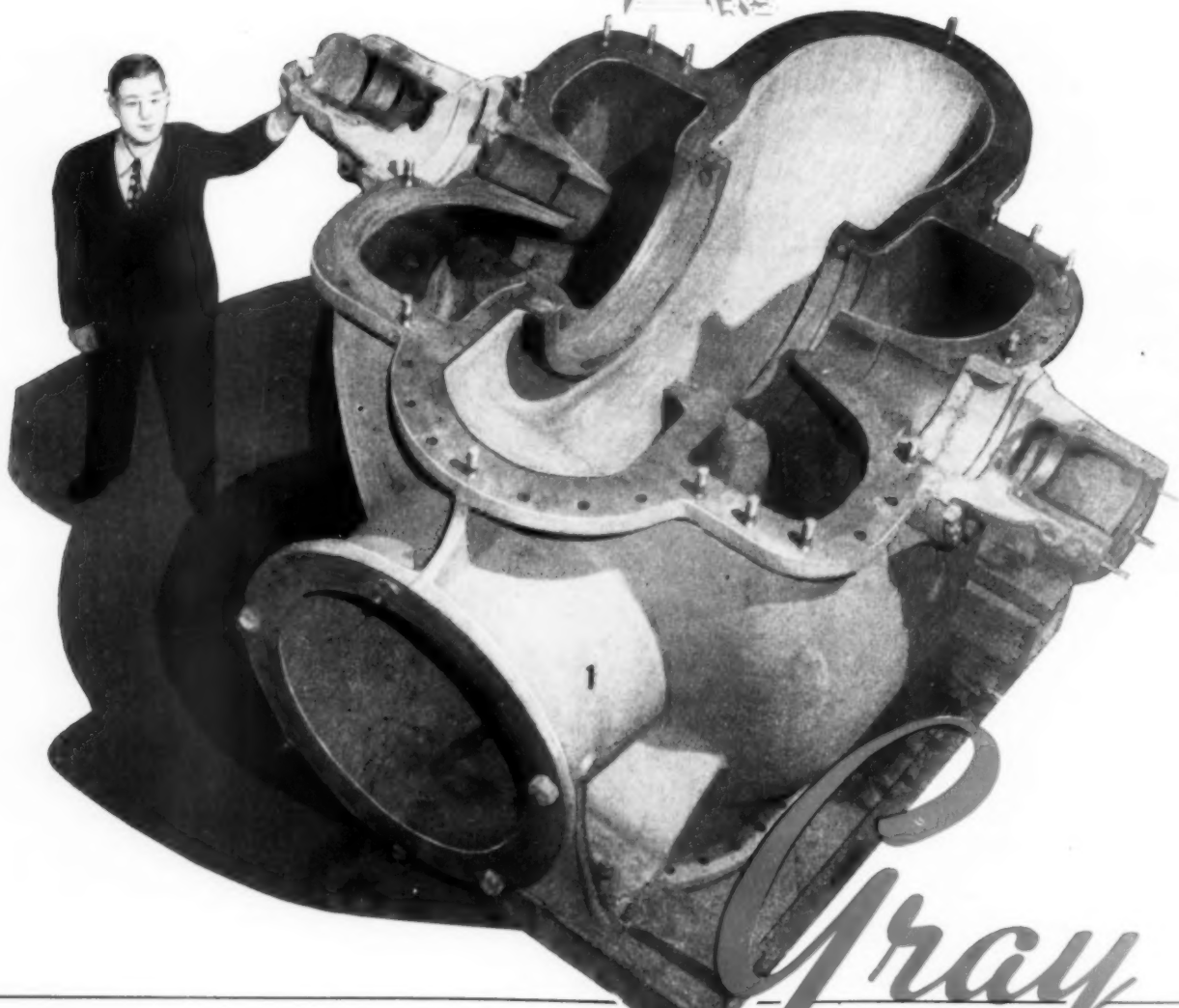
1. A return to more or less standard alloys following the lifting of conservation controls.

2. The decisive reduction in the use of manganese bronze as compared to its expanded usage during the war years, and the continued relative popularity of the aluminum bronzes.

3. The brass and bronze foundries of today are as well or better equipped than at any time in their history and show a continuing trend of modernization with respect to production facilities.

4. The industry as a whole is more specification conscious than ever before. Although the stringent and extensive testing accompanying war production has been largely eliminated, the lessons learned therefrom have continued to carry through for the benefit of quality.

5. The metallurgical research that has been carried on, and is continuing es- (*Please turn to Page* 121)



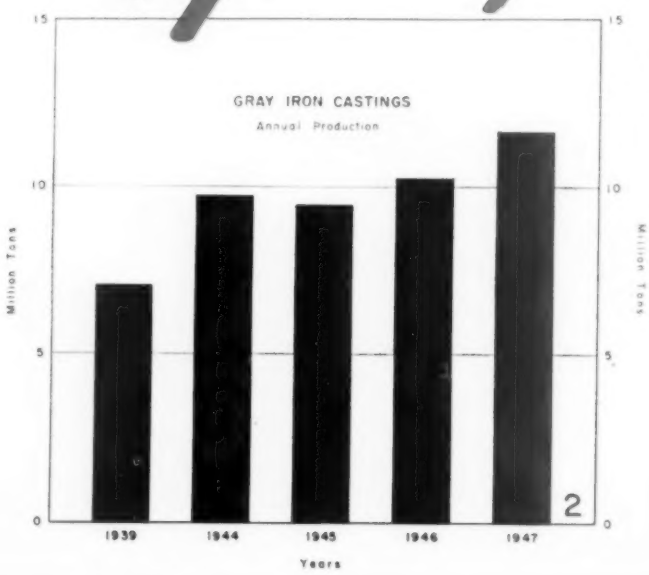
Gray

Fig. 1—This 10-ton casting of nickel-chromium alloyed iron is half of a pump casing used in a city power plant

Fig. 2—Comparative annual production of gray iron castings

Fig. 3—Average earnings and number of workers in gray iron foundries

Fig. 4—Average prices of scrap, pig iron and coke for 1939-1947



Iron

TWENTY million tons of molten gray iron poured into a pavement 4 feet wide and 2 inches thick would girdle the globe at the equator. Gray iron foundries in the United States melted about this much metal and sold 13 million tons of castings during 1947. Cast iron blocks were proposed for paving streets not so many years ago. What a metal reserve such a pavement would provide now!

Gray iron output in tonnage and in dollar value broke the records for a generation during 1947. Supplies of pig iron, scrap, coke, alloys, core oils and compounds, sands, refractories, etc. participated in expanded operations. Equipment builders and engineering and consulting organizations similarly experienced a banner year in common with the revision and revitalization of foundry operations. Events since the war cast their shadows on the charts and show a record breaking year during 1947 in the production of castings. Figs. 2 to 4 illustrate the trend of production and economics in the industry.

Conditions which originated during the war and began with government subsidies led to inflationary trends which reappeared in both the labor and materials costs. Economic pressure in the form of shortages of labor and materials depressed activity since 1945 to date. The controls which to some extent impeded the rate of activity during the war, had their place taken by shortages of raw materials and labor difficulties after the war. Weekly earnings for wage earners in the industry moved from a level of approximately $25 in 1940 to $55 in 1947. Hourly rates passed through a similar change. Raw material costs which were stabilized during the war began to register the effects of increased labor and manufacturing costs since 1945 and advanced 50 per cent or more since controls were removed. The charts show statistical data taken from the Bureau of the Census, Department of Labor, and business publications. Actually, published statistics are incomplete, and it is well known in the industry that a considerable amount of horse trading had to be indulged in to keep plants running. These trades took various forms such as the swapping of scrap for castings, and the purchase of undesirable raw materials along with desirable products when operating needs demanded action.

It is, therefore, clear that casting costs to the consumer were bound to increase. Table I shows a comparison of the costs of a few typical cast iron items before and since the war. It indicates that casting commodities to the consumer have doubled in cost, making labor gains of doubtful value in comparison with increased commodity costs. A converse argument is also tenable in this case, namely that in-

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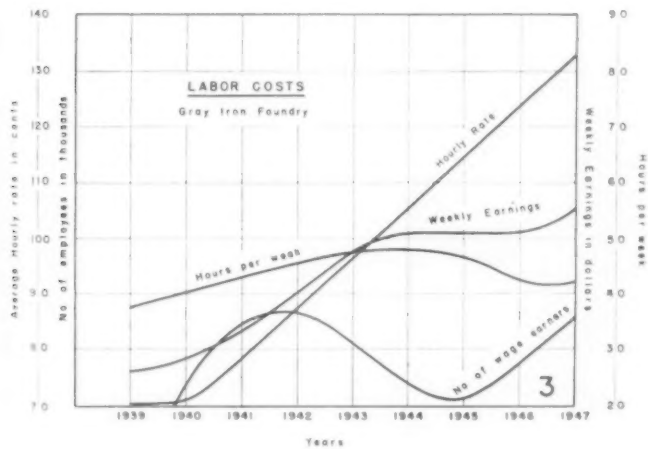
TABLE I—1939 and 1947 Retail Prices of Typical Cast Iron Products

Item	1939 Cost	1947 Cost
Machinists' vise (std wt)—Solid base 4 in. jaw	$5.59	$12.75
—Solid base 4½ in. jaw	7.65	15.75
—Swivel base 4 in. jaw	7.20	16.95
Swivel base 4½ in. jaw	9.60	19.95
Food chopper	.89	1.89
Pillow block—½ in.	.52	.98
—1 in.	.65	1.35
—1½ in.	.89	1.82
Cast iron hot air furnace—20 in. diam. fire pot	67.50	116.50
—22 in. diam. fire pot	82.50	135.00
Skeins (wagon wheels)—3¼ x 9 in.	1.20	2.60
—3¼ x 10 in.	1.20	2.70



creasing commodity costs compelled labor to demand gains. It is time for labor and management to review the process to establish whether any real progress has been made.

Since the foundryman is a processor of raw materials whose costs are fixed for him, his problem becomes one of developing greater efficiency from his labor and equipment in his "Battle of the Bulge" against rising costs. It is this economic pressure that is inseparable from the prevailing activity in modernizing layouts and refitting operations in so many shops. More than any other factor, this pressure will be found at the base of most of the progress made in the industry since 1945.

Molding — Much of the modernization program since 1945 has involved installation of molding machinery. Of approximately 65,000 molding machines located in 4400 foundries, 40 per cent are less than 5 years old. Anyone familiar with the labor cost attending a hand-rammed job realizes the tremendous savings that can be achieved by substituting machine methods for hand work. Perhaps the costliest operation in the foundry is the building of a mold from a solid pattern. Split patterns for small castings can double the output per operator. Patterns mounted on boards will double it again. The output is multiplied 10 to 20 times more over floor or bench molding methods when suitable rigged molding machines take over. The disagreeable features of the manually assembled job are eliminated and the work made much easier.

The automatic features of bottle-making, packaging and cigarette-making machines, for example, invite the study of mechanical engineers who can dupli-

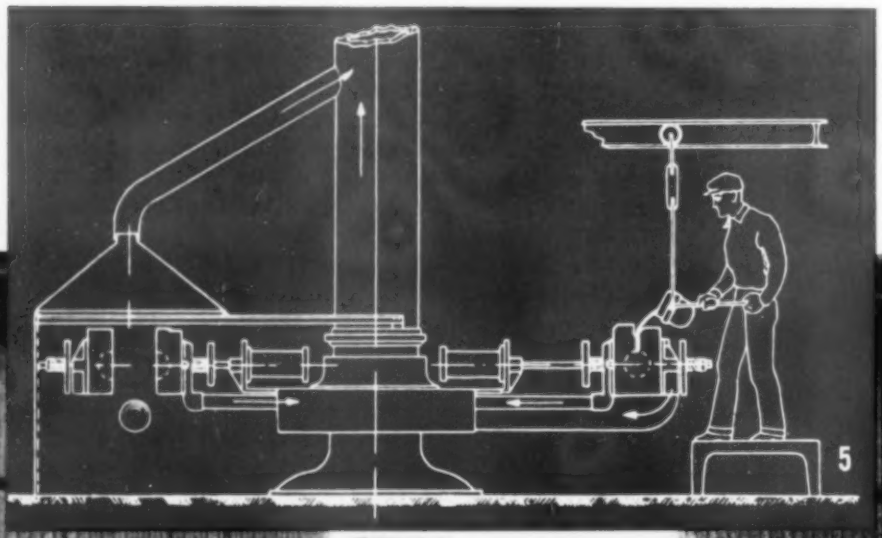
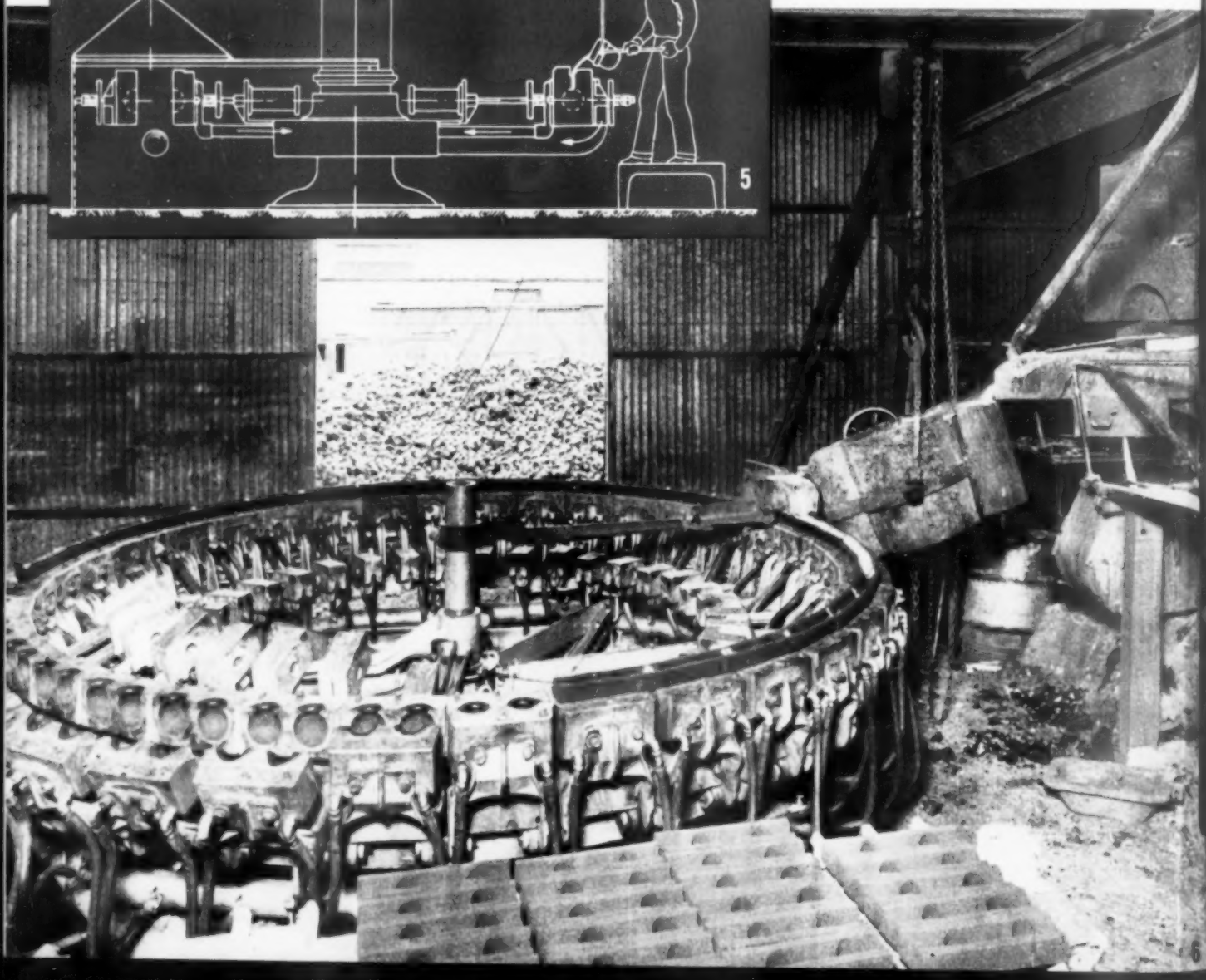


Fig. 5—Diagrammatic drawing of Eaton permanent mold machine
Fig. 6—Payne ball machine for mechanical production of grinding balls
Fig. 7—Assembling mold for diesel engine cylinder head
Fig. 8—Mechanized mold conveying system in gray iron foundry



cate these operations in terms of foundry molding or coremaking practice. Some movement in this direction has been begun. In its initial stages the operation appears most complicated but, with attention focused upon the problem, automatic molding with its associated pouring and shakeout operations should lead the industry toward the production of large tonnages at low cost. Some operations might resemble the permanent mold casting practice pioneered at Eaton Mfg. Co. (Fig. 5), or the centrifugal casting practice employed in the pipe shops. The automatic ball casting machine (Fig. 6) developed by P. M. Payne, represents the culmination of a lifetime of effort devoted to the automatic molding principle. The operation may progress beyond the limits of small castings characteristic of permanent mold practice or tubular shapes that are characteristic of pipe production.

The central station sandslinger and sand conditioning system plus the mold conveyor is the nearest thing to the automatic bottle-making machine or permanent mold machine now available in the industry. This is now a 6 to 12-man molding operation, and like the cupola charging operation, it is capable of refinement and improvement over the long term.

The pallet mold conveyor system offers the closest resemblance to the cigarette making machine that we have of mechaniziation in the foundry (Fig. 8).

7

8

Fig. 9—Poured molds entering hood where smoke and fumes are exhausted. Equipment of this type has done much to improve working conditions

Fig. 10—A 20-ton alloyed cast iron punch press frame, built to withstand 160,000-lb blow without distortion. Metal has 45,000 psi tensile strength

Fig. 11—Closing mold on pallet type conveyor loop in a gray iron foundry

Usually the installation of mechanized mold conveying systems is accompanied by sand handling systems, all of which tend to serve the molders' and machine operators' needs with the least expenditure of muscular effort. Much of the production molding closely approaches automatic operations, but there are still many detailed operations left open to manual labor. We need mechanization at the molding machine where manual labor is still extensively used for filling and ramming flasks, carrying and setting cores, closing molds and setting clamps and weights. The captive shop with its prescribed production is better able to develop improvements. A mechanized unit for producing automotive cylinder blocks, for example, is capable of making 100 castings per hour, and several units of this type working two or more shifts will deliver 5000 to 6000 cylinder block molds per day.

The trend toward mechanization has not always been accomplished without some discouragements. Mechanized operations are capable of turning in a tremendous percentage of scrap if all elements in the sequence of operations fail to function accurately. It has been known that six months to as long as two years may be needed to properly break in a newly installed mechanized operation. In the course of this development, a decision must be made to accept the loss of a mold now and then due to mechanical defects or failure.

Accompanying these transitions, management finds itself confronted with a reluctance of workmen to accept the changes. One foundryman remarked that "his place was now better equipped to turn out less work than ever in its history." The new equipment seemed to deliver less output than the installation preceding it. In some shops where an improved mechanization replaced an older form, the crew in their daily quota in four or five hours' time, making little effort to increase production or compensation to themselves. Constructive arbitration usually solves this problem.

The postwar demand for light castings led to the construction and operation of a considerable number of small shops, all determined to deliver squeezer molded castings in production lots. This mechanization has led to an oversupply of this type of equipment, with the result that the profit margin in these lines is in danger. Some of the more agile shops have directed their activities to more profitable lines. The industry has not been over-extended with new installations, but a slow-down in the rate of operations for some of the squeezer shops indicates that a deterioration in prices might develop which would reduce activities or require readjustments.

Keep Equipment Versatile

Opportunity for jobbing foundries working on miscellaneous castings in nonproduction runs, should not be impaired by the trend toward mechanization. Short-run jobbing shops will, as usual, need to keep their equipment versatile so that available resources can be effectively used. The jobbing production shop with its variety of patterns and indeterminate volume of castings, must keep its operations fluid. There are lessons in procedure to be learned from the precision casting manufacturers who have, in turn, been instructed by the experience of the predecessors operating in the jewelry and dental trades. Precision casting progressed from the jewelry trade into industrial castings during the war and it could very well continue toward applications for the more common gray iron foundry products.

Coremaking—5500 core blowers, 63 per cent of them less than 5 years old (in 2000 out of 5300 foundries) tell the story, in election returns style, of the increasing popularity of this equipment in the foundry. The rapid progress which has been made points the way toward substantial economies in operation. There are many fine details to be solved before blowing cores will be no more difficult an operation than filling cans with tomatoes in the canning factory. One important detail involves the development of a fluid, permeable and refractory sand. The Foundry Educational Foundation may develop the mechanical engineers with a proper slant upon this problem. Today, a coreroom unit of nine men run off 180 cylin-

der barrel cores an hour at the Ferro Machine & Foundry Co. in Cleveland, and similar outputs are delivered in competing shops. The principles which are employed in core blowing indicate that the time may not be far distant when coreboxes and molds may be rammed by the core blowing principle and a large output of castings made available at low cost.

In the jobbing shops are many cases in which the coremaker is able to average only one small core per hour by the method of hand ramming and assembling several pieces. Frequently, these small job lots develop into larger quantity orders, and mechanized coremaking by the molding machine or blower method becomes essential for economy.

Miscellaneous incidents illustrating the resourcefulness of foundrymen in improving operations are represented in experiments upon cores of different colors in which the technicolor program is intended to guide workmen to the proper material for each particular application.

Ferro Machine & Foundry Co. has added another item to casting progress in the replacement with aluminum alloy core wire for the reinforcement of auto cylinder jacket cores. Aluminum alloy wire 43S is used. When the core becomes heated from hot metal, the wire disintegrates into pellets which are shaken out of the intricately cored water jackets of the casting during the cleaning. In another shop we find an effort to add some glamour to the foundry by using facings made up with liquids that give off a friendly odor, thus eliminating "industrial B.O."

Sand Control—Adventures into the processing of sand have led to the commercial launching of the chemically coated product called Westonite, described as a water-soluble, plastic-bonded, self-drying medium designed to improve molding speed and casting

quality. The eyes of the industry are focused on full-scale plant operations which are testing the merits of chemically coated sands. Similar but less spectacular advances have been made with core sand mixtures and facings. Some of these, as is well known in the trade, produce different degrees of hardness, permeability and green strength, along with resistance to penetration, and refractoriness in the mold, combined with suitable dry strength for handling and hot strength for rigidity or collapsibility.

In 3000 foundries, the use of 5500 mullers and an equal number of cutters and mixers, half of them less than 5 years old, demonstrates the attention that is being paid to the rapid and efficient mixing and processing of sand. The low cost of sand and its availability in large amounts close to the industrial areas of the United States, make it a mainstay in the economical operation of the foundry. What the gray iron industry wants is a molding medium as fluid and true to pattern as plaster, but cheaper, quicker drying and more refractory, collapsible and recoverable. If it comes, more progress may be made with automatic molding.

Patterns—If called upon to do so, the average foundryman in this country could cast the old fashioned roll-top desk, complete with pigeon holes and drawer slots, in a single casting. Were he called upon to make a million of them, he would tool up for the job and make it go. Many castings such as cylinder blocks, heads and exhaust manifolds are about as complicated and must be cast pressure tight to boot. The auto casting suppliers in the United States make them rapidly and cheaply. These large volume operations permit the expenditure of considerable money for patterns, flasks, jigs, fixtures and gages.

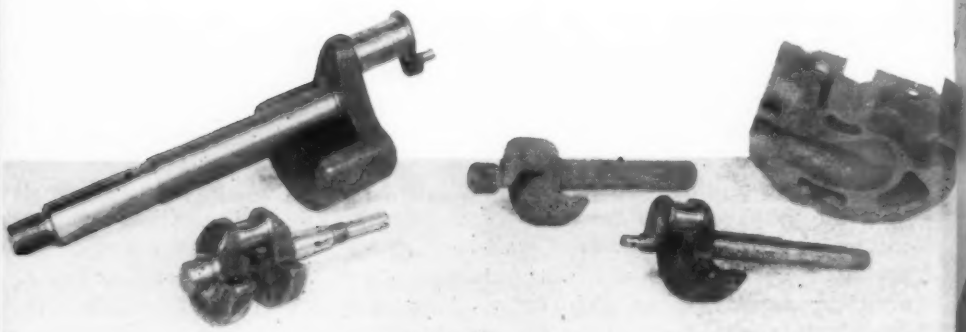
The procurement of a few castings or a single casting introduces a high pattern-cost charge, which must be borne by the customer. Some foundrymen are expert at adapting false framework patterns and sweeps to the construction of molds and cores, but much more working time is needed for the job. The assembly of simple shapes, blocks, angles, or cylinder sections into patterns adequate for short-run or single-casting purposes deserves some study with the hope of reaching a solution of ultimate benefit to the industry. Should we ask designers to help by using standardized shapes such as angles, channels, box shapes and circular sections, which can be swept into plaster for patterns? Can the precision casting procedure be developed to produce a wax replica from a clay model to provide a basic pattern which can be whittled and carved rapidly with mechanical tools to make a single mold; or a plaster or plastic pattern suitable for the "one casting only" and short-run job? Some system must be devised for simplifying pattern construction and costs so that the foundryman is in better position to resist invasion from fabricated wrought metal construction.

Melting — The principle advancement in connection with melting has been the increased installation

Fig. 12—Cable drum casting showing gating system and use of ¾-in. core between casting and 6-in. diam risers to feed casting and facilitate cleaning

Fig. 13—These crankshafts illustrate flexibility available in design of such parts for compressor and air conditioning service. Made of nickel-molybdenum alloyed cast irons

Fig. 14—Bottom half of crankcase for diesel engine



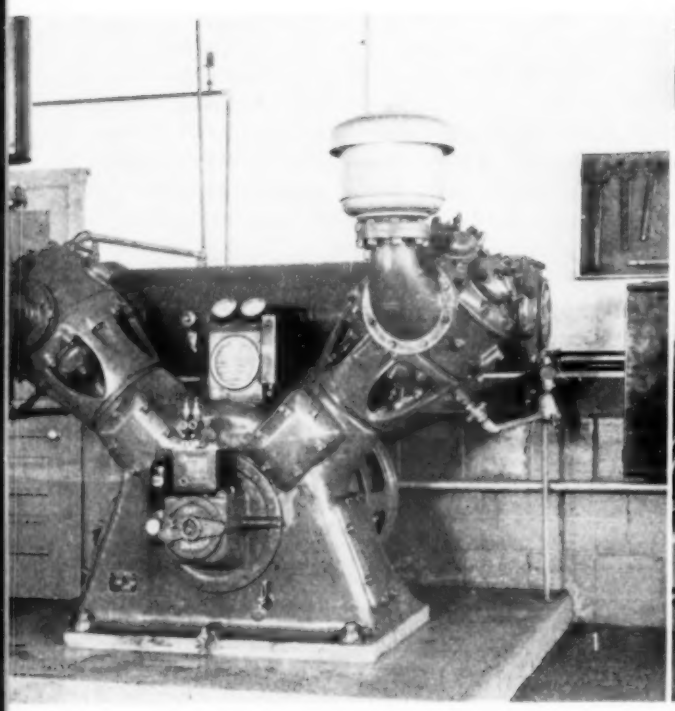
of mechanical charging equipment. Buckets for wheelbarrows. The nonstatic statistics show that out of 1290 charging systems half of them have been installed during the last five years. Shops which employed 10 to 12 men to feed the cupola have cut the requirements for manpower to 2 to 3 men. Any shop charging more than 15 tons a day should look into prospects for economy in a mechanical charging system. In time, a one or two-man charging system handling up to 50 tons will be developed and by this means, a hot, unpleasant job in the foundry will be eliminated.

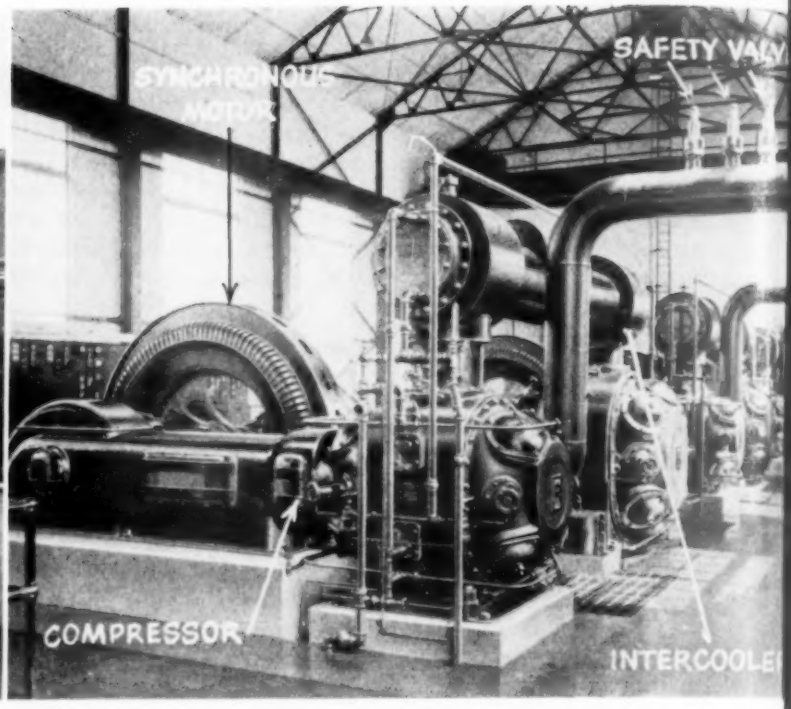
Increased instrumentation at the cupola in the form of air blast pressure and weight measuring systems has been another worthy and popular improvement. Further improvements in the regulating or control systems and simplified methods for cupola lining and repair, indicate opportunities for future improvements. Many other improvements in cupola construction and operation are possible, and I feel sure they are on the way. Recently, David D. Howat of the Royal Technical College, Glasgow, was commissioned to study blast furnace practice in the United States. In contrast to British practice, he remarked that nearly all U. S. furnaces operated alike. Any one of them could be rated as a duplicate of its neighbor. The uniformity of the fuel and ore charges led to a standardization of practice, so that when you saw one plant you saw them all, at least in specific geographical areas. Cupola operation could be similarly standardized, particularly in terms of fuel and blast input, while the chemistries of the delivered product were varied as needed to meet requirements.

The use of oxygen as a means for reducing the heat loss carried out as waste gas may be nearer realization than we think at this time. It now takes $8 worth of oxygen to save approximately $5 worth of coke, but science has a way of narrowing the gap in cost. In the case of oxygen, improved manufacturing efficiency and the use of a "less than commercially pure" product for cupola operations, permits thinking about oxygen at low cost. If considered over a long period of time, there are prospects that increasing fuel costs and decreasing oxygen costs may require revision of cupola design and economics of melting.

As an experimental proposition, Piwowarsky describes a hot blast cupola with a recuperator fitted in the top of the stack and in other cases with separately fired recuperators which are directed toward fuel economy. In some cases, the blast enrichment with oxygen and the recuperator preheated blast practices may lead to better melting conditions capable of improving casting quality and production.

Pouring—Mechanized pouring operations have been developed in a few cases for large foundries with mixed success. Persistent attention to improved controls and supervision for this device should eliminate the misrun mold or mistakenly-run mold. The bulk of the output is still han- (*Please turn to page* 132)





Cutting Maintenance Co

ON AIR EQUIPMENT

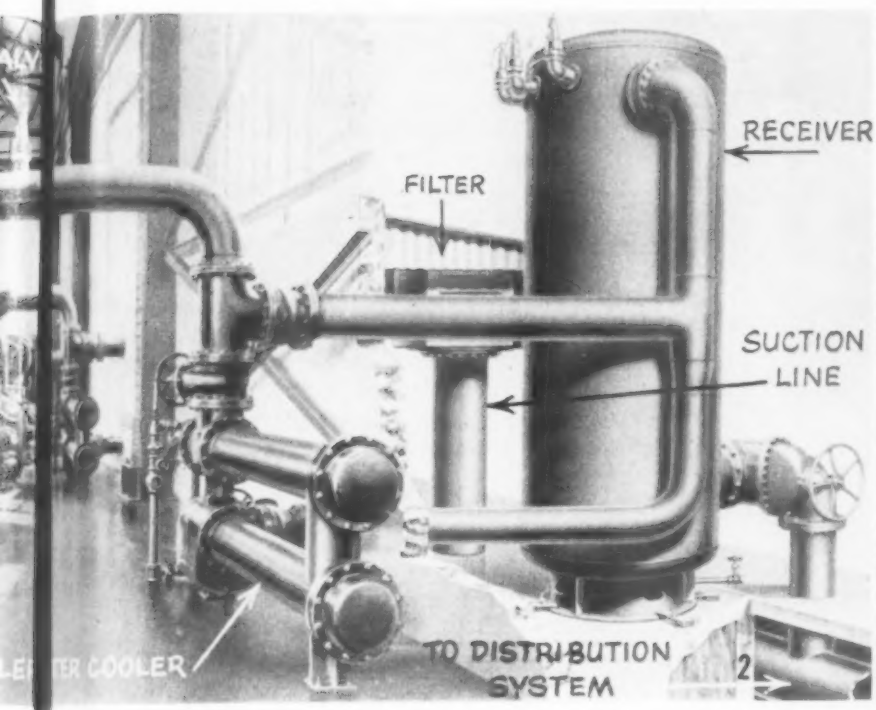
How to keep compressors and air-operated tools in proper working order for most efficient use is discussed in this second of three articles concerned with the operation, care and selection of air equipment in the foundry

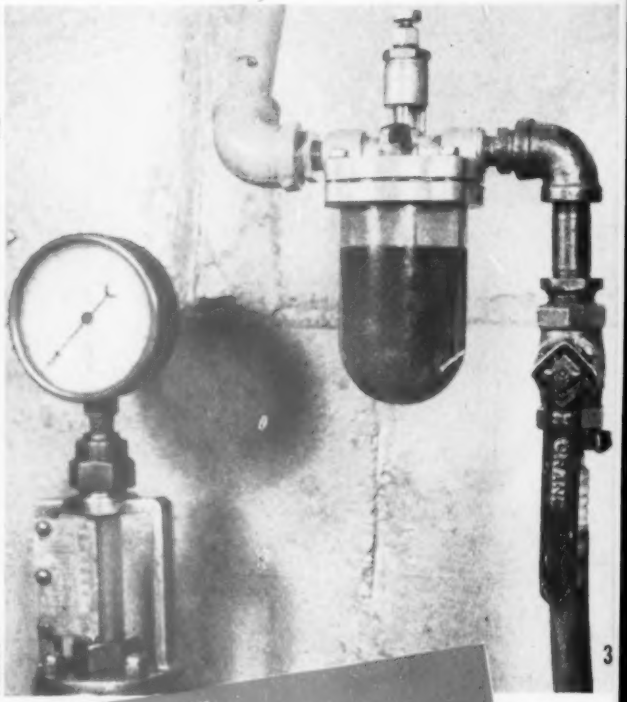
THE importance of proper care and maintenance of all air equipment in foundries is readily admitted, but the actual maintenance performed is such that systems often fall short of reasonable efficiency. The result is unnecessary increases in cost and sometimes serious failures of performance.

Maintenance of the air compressor and equipment actually falls into several fields, often covered by different individuals. This includes: Compressor maintenance and operation; check of air distribution system including elimination of water and dirt; lubrication; direct maintenance of tools and air-driven devices.

Responsibility for each part of this job should obviously first be specified so that definite checkup can be maintained. Proper equipment for the job itself is, of course, necessary. Preventive checkups at regular intervals may well forestall difficulty since there is often a tendency to leave well enough alone until trouble occurs.

Compressor Maintenance and Operation—Perhaps the first step in the full maintenance program is to review the compressor installation itself. The compressor should be located in a clean, well-lighted room which will permit easy cleaning and inspection and any dismantling which may be necessary. In foundries the compressor should be in a dust-tight room with provisions for drawing clean air from the outside to the intake, preferably through a filter, as shown in Fig. 2. Fig. 4 shows in more detail a filter attached to intake pipe to remove dust and dirt and prevent rapid wear of compressor parts. Where the source of air is clean and inside the plant a filter, as shown in Fig. 1, is adequate. All piping connected to the compressor should be arranged with flange fittings or unions close to the compressor, and all overhead piping should be well supported. A well





eCosts

By D. S. LINTON
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Cleveland

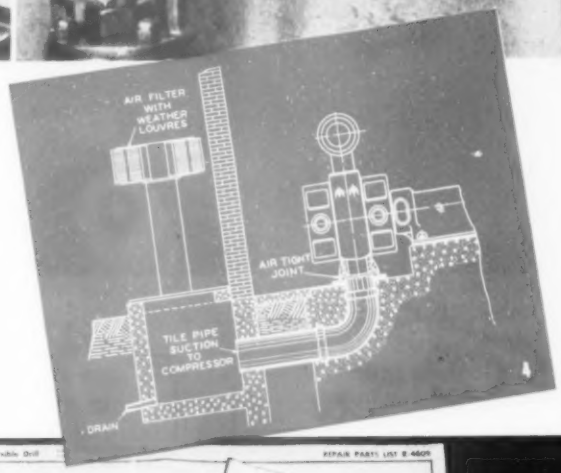


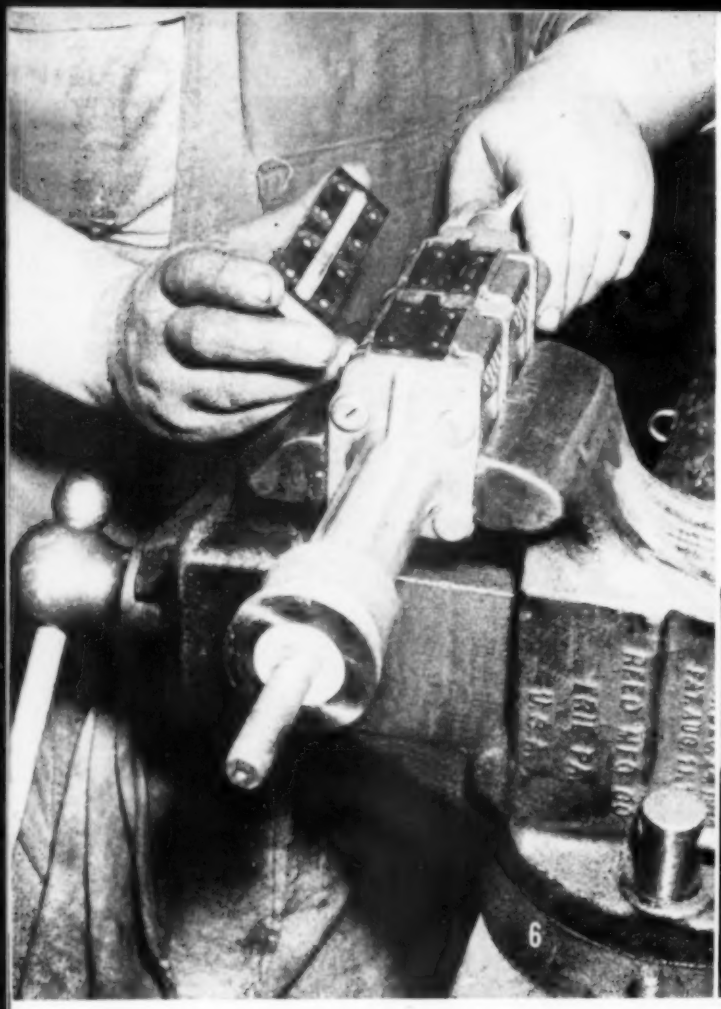
Fig. 1 — Air filter may be attached to compressor when inside air is clean

Fig. 2—Composite illustration of a large, complete compressed air plant

Fig. 3 — Air line lubricator installed in down pipe to lubricate pneumatic tools automatically

Fig. 4 — Filter attached to intake pipe to eliminate foreign matter and prevent rapid wear of working parts

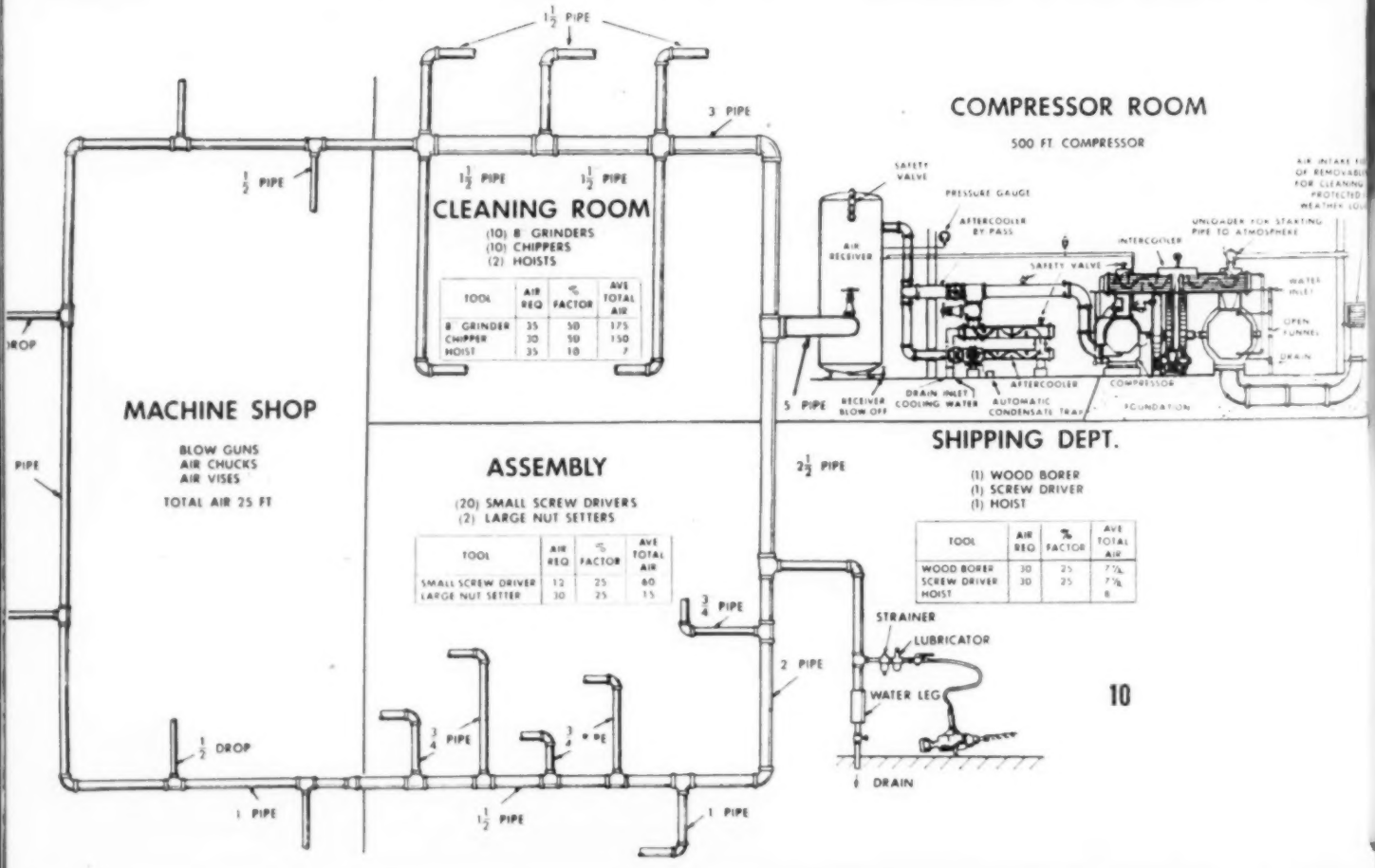
Fig. 5 — Typical data furnished by portable tool manufacturers can prove helpful to maintenance men



organized compressor room is a starting point.

Lubrication of the compressor is, of course, most important. The individual user is relieved of detailed study of the lubrication problem, since the instruction sheet of each compressor manufacturer specifies the correct oil for the type of service of the particular unit. Attention is then focused on a regular periodic system of lubrication to prevent wear and loss of efficiency.

For efficient use of air, compressors should be equipped with aftercoolers. The cost of an aftercooler of 150 to 475 cfm capacity ranges from 18 to 13 per cent of the compressor cost, decreasing as the size of the compressor increases. On the duplex units, the percentage is relatively constant at 8 to 7 per cent over a range from 390 to 1050 cfm and on



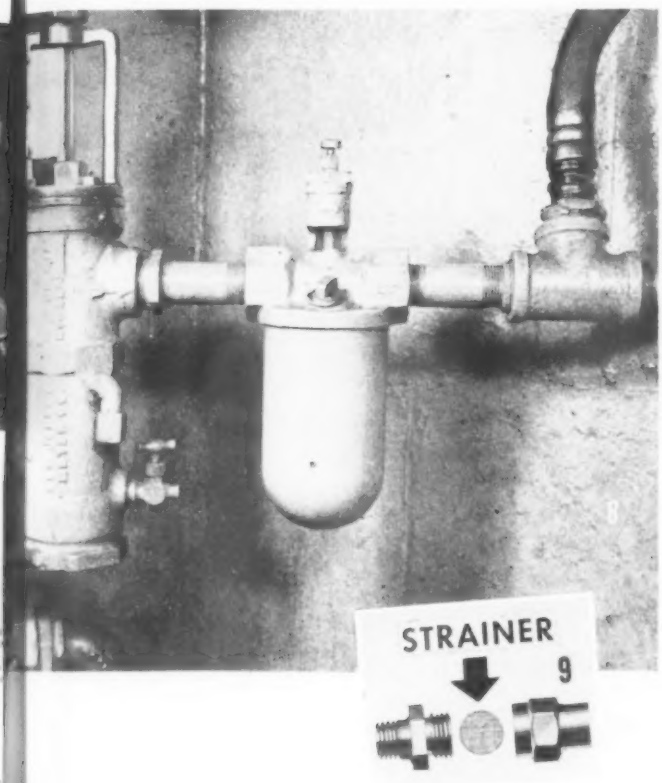
larger machines falls to 5 per cent. This additional initial cost will be repaid many times over the years in reduced maintenance of air-operated equipment.

Air Distribution System—As a starting point for periodic checkup on actual delivered air pressures throughout the system, the compressor should be equipped with an air gage which will show the variations of pressure delivered by the compressor between load and no-load point. The setting point for this may be a matter of serious consideration in order to result in as high delivered air pressures through the system as needed for efficiency.

Piping of the distribution system should be of sufficient size to maintain the maximum pressure at the air-operated device to assure maximum efficiency. The needle pressure gage is a convenient means of checking this delivered pressure with the air tool operating. Fig. 10 illustrates a typical layout for a 500-cfm compressor installation. This layout shows the number of air-driven devices used in different departments. Attention is called to the method shown in the accompanying table to compute the size of the compressor needed to supply these air-driven devices. The figures given are for a typical metalworking plant, but the method itself would be equally applicable to a foundry.

Referring to this table, "How To Determine Compressor Size Required," air tools and devices are first listed by location and the number of tools counted. The column "CFM Required While Tool Is Operating" is found either by testing with a flowmeter and checking the average consumption during operation, or from the manufacturers of the air-driven devices. It must be noted here that many portable tools, when tested for maximum power, will consume rather substantial amounts of air, but the cubic feet per minute required, used for checking air consumption, is the actual consumption caused by the average or ordinary operation of the tool in the shop.

The next column shows "CFM Required if Tool Is Operated Continuously"—the product of the number of tools times the cubic feet per minute required while the tool is operating. This column apparently shows rather large requirements for the compressor, since these requirements total 1120 cfm. However, the tools are in use only part of the day, and the next column, "Percentage of Time in Day Tool Is Operated," must be applied to these figures in order to determine the actual air consumption which must be provided for. Note that this figure drops to 455 cfm which is supplied by a 500-ft capacity compressor. The compressed air user frequently errs in computing air capacity required. Often the figure is computed on the basis of the maximum amount of air which each tool will use multiplied by the number of tools, without any deduction for the percentage of time the tool is operating. This results in a high figure which is impractical. The air consumption required, as shown, in the last column of the accompanying table, is the practical basis for figuring the size of compressor needed, size of pipe lines, etc., unless future requirements are to be (*Please turn to page* 222)



How To Determine Compressor Size Required

Type Tool	Location	No. of Tools	Cfm. Required While Tool Is Operating	Cfm Air Required if Tool Operated Continuously	% of Time in Day Tool Is Operated	Air Consumption = No. Tools Times Cfm Times %
Blow guns, chucks and vises	Machine shop					25
8" grinders	Cleaning	10	35	350	50	175
Chippers	Cleaning	10	30	300	50	150
Hoist	Cleaning	2	35	70	10	7
Small screw drivers	Assembly	20	12	240	25	60
Large nut setters	Assembly	2	30	60	25	15
Wood borer	Shipping	1	30	30	25	7½
Screw driver	Shipping	1	30	30	25	7½
Hoist	Shipping	1	40	40	20	8
Total air				1,120		455

Fig. 6—Checking blades of a portable tool for full efficiency. Blades should be replaced promptly if too thin or badly worn

Fig. 7—Using a hand tachometer to determine the free speed of a portable grinder

Fig. 8—Flowmeter installed in air line in maintenance shop checks air consumption of repaired tool. Note line oiler

Fig. 9—Disassembled strainer showing male and female parts and removable screen which should be cleaned or replaced periodically to permit passage of air at full pressure

Fig. 10—Typical layout of 500-cfm compressor installation. See accompanying table for explanation of air capacity required

Aluminum Alloy Castings

Properties and casting applications of the principal aluminum alloys are described in this second of a series of articles discussing aluminum casting practice. Data obtained in a survey sponsored by the Foundry Division of the Aluminum Association provide the basis for these articles

Temperature-holding melting furnaces at an aluminum foundry

AS SHOWN in Tables II and V, heat treatment of aluminum alloy castings alters not only hardness and strength but other properties as well. At present the following treatments are employed:

1. Artificial aging at elevated temperatures; these treatments include both annealing and aging to improve mechanical properties or dimensional stability.

2. Solution treatment, which involves heating to a point below the melting point of the alloy for a given time and quenching, followed by aging at room temperature.

3. Solution heat treatment and quenching, followed by artificial aging at elevated temperature for further improvement of mechanical properties or dimensional stability. Details of these processes and their application will be covered in a separate article.

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TABLE II—Physical Properties of Aluminum Casting Alloys (Typical Values)

Alloy	Condition * As Cast	Annealed	Artificially Aged	Solution Heat Treated	Solution Treated and Aged	Specific Gravity	Approximate Solidification Range, Deg. F.	Thermal Conductivity at 25° C, †CGS Units	Coefficient of Thermal Expansion per Deg F x 10^{-6}, 68-212° F	Electrical Conductivity, Per Cent of International Annealed Copper Standard
C1				S		2.81	1195-1020	0.33	12.7	35
C1					S	2.81	1195-1020	0.35	12.7	37
CG1		S				2.95	1160-1005	0.38	12.2	41
CG1					S	2.95	1160-1005	0.31	12.2	33
CG1	P					2.95	1160-1005	0.32	12.2	34
CN21		S				2.81	1165-995	0.40	12.5	44
CN21			P			2.81	1165-995	0.32	12.5	34
CN21					P	2.81	1165-995	0.32	12.5	33
CS4				P		2.78	1160-980	0.33	12.2	35
CS4					P	2.78	1160-980	0.45	12.2	50
CS21	P					2.95	1120-940	0.25	11.9	25
CS22	P					2.91	1165-975	0.28	12.2	30
CS22	S					2.91	1165-975	0.26	12.2	27
CS23	P					2.89	1110-930	0.24		24
G1	S					2.65	1185-1075	0.33	13.3	35
G3				S		2.58	1150-840	0.21	13.6	21
GS1	S					2.65	1170-1090	0.35	13.0	38
GZ1	P					2.65	1180-1050	0.32	13.3	34
S1	S					2.69	1175-1070	0.35	12.2	38
S2	S					2.69	1175-1070	0.35	12.2	38
SC1	P					2.79	1140-960	0.34	11.9	37
SC8	S					2.77	1120-950	0.27		27
SC8	P					2.77	1120-950	0.28		29
SC21			S			2.70	1160-1075	0.40	12.2	43
SC21					S	2.70	1160-1075	0.34	12.2	36
SC21					P	2.70	1160-1070	0.36		39
SC41			P		P	2.68	1060-1055	0.26	11.2	28
SC42					S	2.68	1110-1055	0.27	11.9	29
SC42					P	2.68				
SG1			S			2.68	1130-1075	0.40	11.9	43
SG1					S	2.68	1130-1075	0.36	11.9	39
SG1					P	2.68	1130-1075	0.38	11.9	41
SN41			P			2.72	1095-1000	0.28	10.5	29
ZG41	S					2.80			13.7	25

* In these columns *S* denotes specimen cast in green sand; *P* denotes chill-cast specimen having properties similar to a permanent or semipermanent-mold casting.

† CGS units—calories per second per square centimeter per centimeter of thickness per degree Centigrade.

Principal Alloying Elements—Out of the large number of elements that can be alloyed with aluminum, practical considerations have limited them to comparatively few in present commercial alloys. These are principally copper, silicon, magnesium, zinc, and nickel, and to a lesser extent manganese, iron, chromium, titanium, and tin. The various elements, of course, are added for a variety of purposes. Different ones of these elements, or combinations of them, are added for the purpose of forming alloys with improved mechanical properties as well as superior casting qualities. In general, the aluminum-silicon alloys show greater improvement in casting qualities but not quite as high mechanical properties as those in which copper or magnesium are the principal alloying agents. None of the alloys show improvement in resistance to corrosion as compared with pure aluminum, but some of them are equally resistant, or practically so, under most environments.

As shown in Table III, which lists the composition of the most common alloys, copper and silicon are added by far the most often and, with few exceptions, in the largest proportions. Zinc has been used extensively in Europe because of its lower cost, but has had limited use in the United States.

Magnesium Extensively Employed

Magnesium has come into use in recent years as improved methods of casting these alloys have brought lower cost. In fact, some of the highest strength aluminum alloys are those containing this extremely light metal. The remaining alloying elements are added for special purposes where special characteristics are required, and in general are used in small but carefully controlled proportions. As mentioned before, iron is one of the impurities in commercial aluminum, and in only a very few alloys is any iron intentionally added.

Some alloys reach their optimum properties in the as-cast condition, but the higher-strength and special-purpose alloys usually depend on heat treatment to develop their superior or special characteristics. Heat-treatable alloys, as those responding to heat treatment are called, all contain at least one element that is more soluble in aluminum at elevated temperatures than at room temperatures. For best results this element, such as the 4.5 per cent copper of the aluminum-copper series, is added in amounts that are completely soluble at temperatures below the melting point of the alloy.

Most alloys are most suitable for sand casting but only a few are more satisfactory for permanent mold work where the chilling effect of the iron mold produces higher density, smoother finish, and greater uniformity.

Nomenclature—No universally accepted nomenclature for commercial aluminum alloys has been developed thus far, with the result that several different designations often are applied to the same alloy. The Aluminum Co. of America has developed its own designations[3], and these have come to be widely used. The Society of Automotive Engineers

has formulated a different set of designations[4] which are widely recognized in the automotive and aeronautical fields. During World War II several governmental bodies adopted still different designations in the development of specifications for the various alloys required in war equipment. Perhaps the best known and most inclusive of these are the so-called Federal Specifications[5].

In addition to these and other less extensive nomenclature promulgated by other bodies, the American Society for Testing Materials has produced a still different set of designations[6] in its development of standard specifications for the alloys themselves. Because the American Society for Testing Materials nomenclature is believed to be the most widely representative of the various interests involved in the industry as a whole, this nomenclature will be used throughout this series of articles wherever possible. Table III shows these four systems of nomenclature and the composition of the alloys to which they apply.

Aluminum Alloy Castings

Physical and Mechanical Properties—Composition, outstanding characteristics, and some of the more important uses of the most widely used commercial alloys of aluminum are given in Tables III and IV. The principal physical and mechanical properties are listed in Tables II and V; values given are typical and may be somewhat different in any given casting.

There is considerable overlapping of mechanical properties among the various classes of alloys. Therefore, within rather wide limits the selection of a particular alloy for a given purpose is greatly simplified. Once the mechanical requirements are known, final selection can be made on the basis of which alloy in the chosen group most completely will meet the other requirements.

Commercially pure aluminum has a specific gravity of 2.71; as shown by Table II, the specific gravity of the various casting alloys varies but little from this value. For purposes of approximation all of the casting alloys may be considered to weigh 0.1-lb per cu in.

Pure aluminum has an electrical conductivity on a volume basis in excess of 64 per cent of that of the international annealed copper standard; but because of its low specific gravity the mass conductivity is more than 212 per cent that of copper. Commercially pure aluminum therefore has found extensive use in the electrical industry. Because of its poor casting qualities aluminum castings seldom are made without adding at least a small percentage of some other element. Addition of the various alloying elements affects the conductivity as shown in Table II. Although aluminum has been found by laboratory investigation to be slightly, but definitely, paramagnetic, both aluminum and its alloys are for all practical purposes nonmagnetic and are usually considered so.

Aluminum of commercial purity has a thermal conductivity of 0.52 in cgs units. As shown in Table II, many of the alloys have a conductivity about three times that of cast iron, which has a value of 0.12 in cgs units. The coefficient of thermal expansion is slightly more than twice that of steel and cast iron, except for alloys of the low-expansion type which have lower coefficients than the other aluminum alloys.

For all alloys the modulus of elasticity is approximately 10,300,000 psi; the modulus of rigidity 3,850,-

TABLE III—Nomenclature and Composition of Commercial Aluminum Alloys for Sand and Permanent Mold Castings

Nomenclature					Composition, Per Cent (Balance Aluminum)											
ASTM	ALCOA	SAE	Fed. Specs. —QQ-A— 601	596	Cu	Fe (Max.)	Si	Mn (Max.)	Mg	Zn (Max.)	Cr (Max.)	Ti (Max.)	Ni (Max.)	Others, Total	Heat Treatable?	Sand or Permanent Mold
C1	195	38	4		4.5±0.5	1.0	1.5 max.	0.3	0.03 max.	0.3		0.2		0.15	Yes	Sand
CG1	122	34	7	2	10.0±0.8	1.5	2.0 max.	0.5	0.25±0.10	0.5		0.2	0.3	0.3	Yes	Both
CN21	142	39	6	3	4.0±0.5	1.0	0.7 max.	0.3	1.5±0.3	0.3	0.2	0.2	2.0±0.3	0.15	Yes	Both
CS4	B195*	380		4	4.5±0.5	1.2	2.5±0.5	0.3	0.05 max.	0.3		0.2	0.3	0.3	Yes	Perm.
CS21	138				9.5±0.5	1.5	4.0±0.5	0.5	1.0±0.5	0.5		0.2	1.0	0.5	No	Perm.
CS22	113†	33	9	1	7.0±1.0	1.4	2.5±1.5	0.5	0.07 max.	2.5		0.2	0.3	0.5	No	Both
CS23	152	300			6.5±1.0	1.5	5.5±0.5	0.8	0.4±0.2	0.8		0.2		0.8	Yes	Perm.
G1	214	320	5		0.1 max.	0.5	0.3 max.	0.3	4.0±0.5	0.1		0.2		0.15	No	Sand
G3	220	324			0.2 max.	0.3	0.2 max.	0.1	10.0+0.6 −0.5	0.1		0.2		0.15	Yes	Sand
GS1	B214‡				0.3 max.[a]	0.6[a]	1.8±0.4	0.8[a]	4.0±0.5	0.3	0.2	0.2		0.05[e]	No	Both
GZ1	A214				0.3 max.[a]	0.6	0.3 max.	0.8[a]	4.0±0.5	1.8±0.4		0.2		0.05[e]	No	Perm.
S1[e]	43	35	2	7	0.1 max.	0.8	5.0+1.0 −0.5	0.3	0.05 max.	0.3		0.2		0.05[e]	No	Both
S2[e]	43	35	2	7	0.3 max.[b]	0.8	5.0±0.5	0.3	0.05 max.	0.3	0.2	0.2		0.3	No	Both
SC1	A108			5	4.5±0.5	1.0	5.5±0.5	0.3	0.1 max.	0.8		0.2		0.5	No	Perm.
SC8	319	326			3.5+1.0 −0.5	1.2	6.0+1.0 −0.5	0.5	0.15[c]	1.0		0.2	0.3	1.0	Yes	Both
SC21	355	322	10	6	1.25±0.25	0.8[d]	5.0±0.5	0.5[d]	0.5±0.1	0.3	0.2	0.2		0.15	Yes	Both
SC41		328		10	1.5±0.5	0.7	12.0±1.0	0.7±0.2	0.7±0.3	0.4		0.2	0.05	0.5	Yes	Perm.
SC42		327			1.5±0.5	1.0	7.8±0.8	0.4±0.2	0.4±0.2	0.5	0.3	0.3	0.2	0.5	Yes	Sand
SG1	356	323	3	8	0.2 max.	0.6	7.0±0.5	0.3	0.3±0.1	0.3		0.2		0.15	Yes	Both
SN41	A132	321	12	9	1.0±0.5	1.3	12.0±1.0	0.1	1.0±0.3	0.1		0.2	2.5±0.5	0.05[e]	Yes	Perm.
ZG41	605	310			0.3 max.	1.0	0.25 max.	0.3	0.6+0.05 −0.1	5.5±0.5	0.5±0.1	0.2±0.1		0.05[e]	Yes	Sand

[a]—If the copper content plus the iron content exceeds 0.5 per cent, a manganese content of at least 0.3 per cent is desirable. [b]—If agreed upon by the manufacturer and the purchaser, the copper content may be 0.6 per cent maximum. [c]—If agreed upon by the manufacturer and the purchaser, the magnesium content may be 0.5 per cent maximum. [d]—If the iron content exceeds 0.4 per cent, it is desirable to have manganese present in an amount equal to one-half of the iron. [e]—Others, each.

ASTM—American Society for Testing Materials. Alcoa—Aluminum Co. of America. SAE—Society of Automotive Engineers. Fed. Specs.—Federal Specifications. Numerals listed in table are class numbers in these specifications: QQ-A-601 for sand castings and QQ-A-596 for permanent-mold castings.

* Alcoa sand casting alloy 108 is similar. † Alcoa sand casting alloys 112 and 212, and permanent mold alloy C113 are similar. ‡ Alcoa sand casting alloy F214 is similar. ° Alloys S1 and S2 are identical except that impurities in S1 are held to lower limits, giving it greater corrosion resistance.

000 psi; and Poisson's ratio 0.33. Values given in the tables for yield strength show the stress that produces a permanent set of 0.2 per cent of the initial gage length. Endurance limits are based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type of machine and specimen. Some values of 100 millions are published.

The relatively low modulus of elasticity, particularly as compared with iron and steel, means that deeper sections must be used where aluminum is loaded as a beam. By proper design, however, deflections in castings can be kept within desirable limits, and at the same time weight savings of from one-half to two-thirds as compared with cast iron

TABLE IV.—Outstanding Characteristics and Principal Uses of Commercial Aluminum Alloys

Alloy	Corrosion Resistance	Casting Properties	Machinability	Outstanding Characteristics	Principal Uses: Sand Castings	Principal Uses: Permanent Mold Castings
C1	Good	Good	Very good	Good combination of mechanical properties.	General, where high strength and ductility are required—flywheel housings, bus wheels, spring hangers, aircraft wheels, fittings, crankcases.	
CG1	Fair	Good	Excellent	Good strength and hardness at elevated temperatures. Good wear resistance.	Air-cooled cylinder heads, solution heat-treated and aged castings used for bearings, bearing caps, bushings, tappet guides.	Meter parts, bushings, bearing caps, automotive pistons.
CN21	Good	Fair	Very good	Good strength at elevated temperatures.	Air-cooled cylinder heads, Diesel engine pistons.	Air-cooled cylinder heads, motorcycle, diesel, and aircraft pistons, aircraft generator housings.
CS4	Good	Good	Good	Good combination of mechanical properties. Good weldability.		General, where high strength and ductility are required — aircraft fittings, wheels, and gear housings, railroad car seat frames, compressor connecting rods, fuel pump bodies.
CS21	Fair	Good	Very good	High hardness as cast; retained at elevated temperatures.		Sole plates for electric hand irons.
CS22	Fair	Very good	Excellent	Good general purpose alloy. Good pressure tightness.	Automotive crankcases, oil pans, transmission cases, washing machine agitators, miscellaneous general-purpose castings.	Automotive cylinder heads, vacuum cleaner housings, washing machine agitators, miscellaneous general - purpose castings.
CS23	Fair	Good	Good	High hardness; retained at elevated temperatures.		Pistons and other high-hardness applications.
G1	Excellent	Fair	Very good	High corrosion resistance and good mechanical properties.	Dairy and food handling equipment, cooking utensils, fittings for marine, chemical, and sewage use, ornamental housings.	
G3	Excellent	Fair	Very good	Highest strength and elongation of any sand casting alloy.	High-strength structural castings—aircraft fittings, levers, brackets, railroad passenger car frames. Not recommended where operating temperatures exceed 250° F.	
GS1	Excellent	Fair	Excellent	High corrosion resistance.	Cooking utensils and pipe fittings. Ornamental hardware and architectural castings.	Cooking utensils and pipe fittings for marine and general use.
GZ1	Excellent	Fair	Excellent	High corrosion and tarnish resistance.		Cooking utensils and castings to resist atmospheric corrosion.
S1	Very good	Very good	Fair	High corrosion resistance and pressure tightness.	Cooking utensils, marine fittings, food handling equipment, architectural and ornamental parts.	General purpose castings of thin sections — carburetor bodies, refrigerator fittings, and cooking utensils.
S2	Good	Very Good	Fair	Same as S1 except lower corrosion resistance.	Same as S1 where the higher corrosion resistance is not required.	Same as S1 where the higher corrosion resistance is not required.
SC1	Fair	Excellent	Good	Good pressure tightness and weldability.		Ornamental grilles, reflectors, and general-purpose castings requiring leak tightness and moderate strength.
SC8	Fair	Good	Good	Good general purpose alloy.	General-purpose castings—piano plates and frames, gasoline and oil tanks, crankcases.	General-purpose castings. Typewriter frames, engine parts, water-cooled cylinder heads.
SC21	Good	Excellent	Good	Good pressure tightness and weldability. Retains strength at elevated temperatures.	Wide variety of aircraft castings requiring pressure tightness and intricate high-strength castings; printing press bed plates.	Wide variety of aircraft castings requiring pressure tightness, and intricate high-strength castings.
SC41	Good	Fair	Fair	Good hardness and wear resistance at elevated temperatures.		Pistons.
SC42	Good	Excellent	Good	Retains strength at moderately elevated temperatures.	Wide variety of aircraft castings and intricate high-strength castings.	
SG1	Excellent	Excellent	Good	High strength and pressure tightness. Good weldability.	General, where high strength and corrosion resistance are required, particularly in automotive field.	General, where high strength and corrosion resistance are required — machine tool parts, hand wheels, aircraft pump parts.
SN41	Good	Fair	Fair	Good properties at temperatures up to 500-600F. Low coefficient of thermal expansion. Good weldability.		Pulleys and sheaves, automotive and diesel pistons.
ZG41	Good	Good	Excellent	Good physical properties obtained by aging.	General, where high strength and ductility are required. May be aged at room temperature.	

can be effected. The lower modulus of elasticity is an asset where impact loads are to be resisted, since in general the lower the modulus the greater the ability to absorb energy without permanent set.

In common with other materials, the tensile strength, yield strength, and modulus of elasticity of aluminum alloys are lower at elevated temperatures than they are at ordinary temperatures. Some alloys, however, have better performance in this respect than others, as covered in more detail hereinafter and as indicated in Table VI. The elongation usually increases as the temperature is raised until at a temperature a little below the melting point (the hot-short range) it drops nearly to zero.

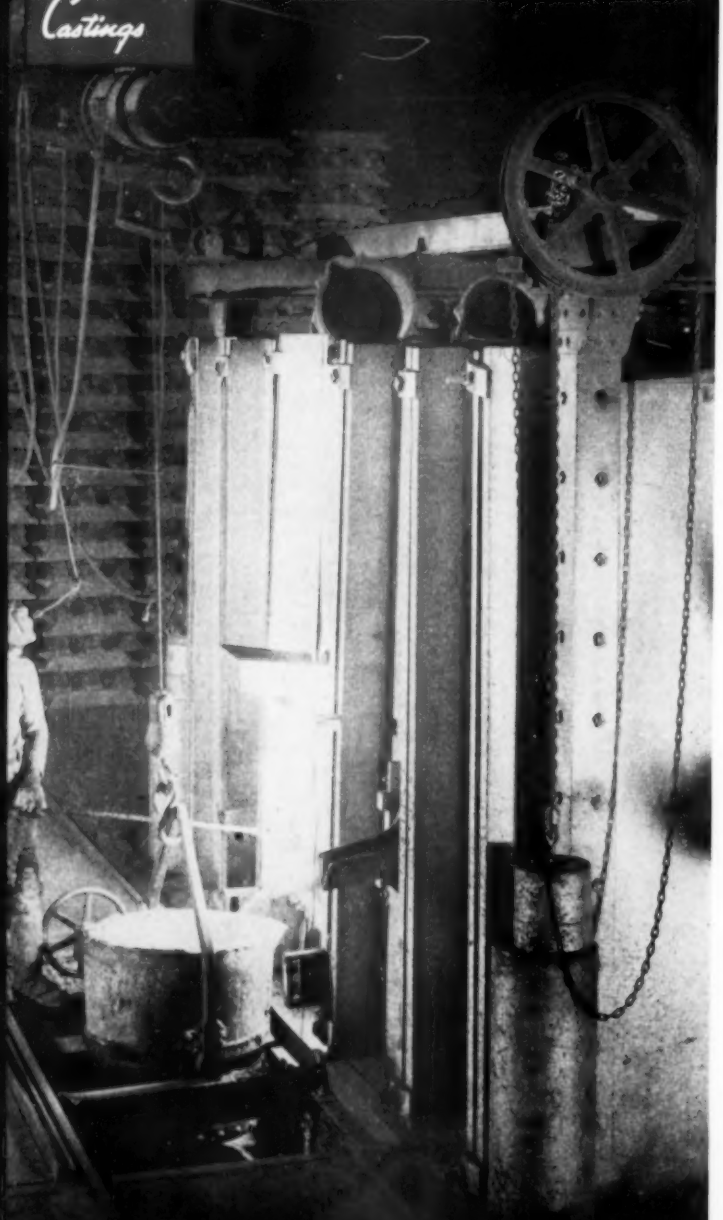
At temperatures below ordinary temperatures, the mechanical properties are somewhat higher. Therefore, at any lowered temperatures likely to be encountered in ordinary applications, such as in refrigerators and in aircraft at high altitudes, the mechanical performance of aluminum castings is generally considered to be improved.

Aluminum castings will exhibit a certain amount of creep and growth under some conditions. Creep, or permanent deformation under long-time sustained loads, has been observed at or near the yield-strength, but practically none occurs at stresses of about half the yield-strength value or less.

On exposure to elevated temperatures many aluminum alloys exhibit an increase in volume, over and above normal thermal expansion, which is retained upon return to the original temperature. This phenomenon is called growth. The greatest increase in linear dimension observed so far is less than 0.2 per cent; and, unlike cast iron which is subject to indefinite growth, aluminum growth proceeds to a definite point and stops.

Aluminum Alloy Castings

Operator tapping an aluminum melting and alloying furnace



Need Proper Heat Treatment

Growth could be particularly troublesome in connection with pistons and cylinder heads which are exposed to elevated temperatures during normal operation and with any other casting where dimensional stability is a factor. By proper heat treatment, however, this growth process may be carried essentially to completion before the castings are placed in service and subsequent growth thus prevented. This treatment consists of artificial aging at relatively low temperatures for comparatively long periods, the temperature and time depending on the particular alloy. Both creep and growth can easily be allowed for in good design, and when proper allowances are made neither is particularly troublesome.

Although some aluminum alloys have a tendency to score or scuff when subjected to mechanical wear, others, notably the piston alloys and the newer bearing alloys, have excellent wear-resisting qualities. The successful functioning of aluminum as a bearing material depends on high hardness and smooth finish of the opposed bearing surface and adequate lubrication.

Most of the aluminum casting alloys are easily welded by any of the common methods. It is thus easy to join aluminum castings to other aluminum parts in composite structures. In addition, it is often possible to repair discontinuities in castings by filling in with weld metal and machining the surface.

All aluminum alloys have good resistance to corrosion, but some are better than others in this respect, as indicated later in this article.

Because aluminum is so high in the electrochemical series (atomic weight 13) it is subject to galvanic attack if joined to most of the other metals, such as copper and steel, in the presence of an electrolyte. This accounts for some of the severe corrosion that has been reported in marine applications, sea water being an excellent electrolyte. Extensive tests, however, have shown some aluminum alloys to have excellent resistance to corrosion by sea water where contacts with other metals are avoided.

The Washington Monument in Washington affords a splendid example of alum- (*Please turn to page* 171)

This discussion of cost savings which can be effected through reduction in labor turnover was presented by the author before the 19th annual meeting of the Gray Iron Founders' Society at Milwaukee, Oct. 2

Stabilization of Employment

IN GRAY IRON FOUNDRIES

By B. A. KRAWCZYK
Supervisor, Compensation Department
Allis-Chalmers Mfg. Co., Milwaukee

THIRTY-SIX years ago, the state of Wisconsin pioneered in the field of accident prevention, when it adopted the Workmen's Compensation Law. Accordingly, an employer became liable to his employees, who became injured during the course of their employment, for hospital and medical expenses as well as a weekly indemnity, irrespective of whether there was negligence on part of the employee or the employer. The employer was obliged either to insure this risk with an insurance company, or if, upon showing that he was in good financial condition, to insure himself by posting a bond. As time went on, employers began to take note of the cost of this program and began to take steps to minimize it.

It was logically reasoned that in order to cut costs of workmen's compensation, an attempt must be made to prevent accidents. Thus, was born the "safety movement" in the United States. As time progressed, other states adopted workmen's compensation laws, so that today every state, except Mississippi, has a workmen's compensation law on its books. The "safety movement" continued to grow, so that now every employer places real emphasis on safety activity within his own plant.

Do you see what has happened? Here was an incentive to prevent accidents—to save lives—and to cut the cost of production. Here was experience rating in its truest form.

Accidents Can Be Prevented

There were those, of course, who stated that accidents could not be prevented, but they have lived long enough to know that, with human ingenuity, much has been done, and the person who still says that industry must continue to take its toll of lives is guilty of heresy.

In 1932, Wisconsin pioneered in another field—this time, unemployment compensation. While other states were vaguely studying the problem, Wisconsin began to work for the solution of the problem of unemployment through positive action. These things were taken as fundamental, namely: That there is probably nothing that a man desires more earnestly than security for himself and his family; that to attain real security there is nothing he needs more consistently than an assured income; that there is no more effective way of getting that income than by having a steady job. Unemployment is admittedly a bad thing and, therefore, we tried to take steps to eliminate it. We considered steady employment the desirable thing and, therefore, aimed to encourage it.

After having noted, during a period of 20 years, what a salutary effect the penalty of compensation for injuries and the benefit of experience rating, had on the individual employer in industry, Wisconsin determined to try that method on the problem of unemployment. Consequently, it enacted the first unemployment compensation law in the United States, with experience rating provisions—the same principle which worked so well in the workmen's compensation field.

We, in the state of Wisconsin, do not say that the primary purpose of unemployment compensation is the payment of benefits. Rather, we believe that the primary purpose of unemployment compensation is the stabilization of employment, with the payment of benefits as a secondary purpose—a penalty for the failure of employers to stabilize their employment.

By the terms of the experience rating provisions in the state of Wisconsin, an employer who has achieved steady employment is rewarded by a lower contribution rate. On the other hand, an employer who has a poor record of steady employment is penalized.

Here is the way it works. The standard contribution rate under all state unemployment compensation laws is 2.7 per cent of payroll, limited to the first $3000 paid to each individual. In Wisconsin, an employer with a good experience may reduce this rate of 2.7 per cent to 1 per cent, or even 0 per cent. An employer whose experi- (*Please turn to page* 200)

Questions and Answers

Specifications for Cast Iron

Q.—Do you have or can you tell us where we can secure copies of SAE standards? Specifically we would like to know analyses and material specifications for SAE irons Nos. 111 and 120.

A.—SAE specifications are issued by the Society of Automotive Engineers, 29 West 39th St., New York, and may be purchased from that organization.

Specifically SAE No. 111 calls for a plain gray iron for flywheels and transmission cases with suggested analysis of 2.20 per cent Si; 0.60 per cent Mn; 0.20 per cent P max; 0.13 per cent S max, and 3.25 per cent TC. Minimum physical properties are given as 30,000 psi tensile strength; 18,000 lb transverse load, and 162 to 207 brinell hardness number.

SAE No. 120 calls for an alloy iron with the basic composition of 2.25 per cent Si; 0.60 per cent Mn; 0.20 per cent P max; 0.12 per cent S max, and 3.25 per cent TC. That specification is for cylinders and, in addition to the basic elements such alloying agents as Cr, Ni, Mo, V, etc. are added. Physical properties (minimum) are designated as 35,000 psi tensile strength; 2200 lb transverse load, and 207 to 241 brinell hardness number.

Trouble Caused by Zinc Fumes

Q.—We are pouring some thin plates using scrap brass as the raw material since composition or physical properties are not essential. However, when the metal reaches 1900 to 1950° F, it starts to burn and gives off a heavy white smoke. By the time we are ready to pour (2100 to 2150° F), we can hardly see to pour, and are misrunning our castings. We are using a pit-type, coke-fired furnace, and would like to have information on some way to prevent smoking and burning of the metal.

A.—Due to the fact that zinc boils around 1665° F, all zinc-containing alloys will evolve fumes or smoke of zinc oxide when that temperature is reached, and the higher the zinc content, the greater the evolution with increasing temperature. Various procedures are employed to mitigate the smoke problem with zinc-containing alloys. One is to keep the pouring temperature as low as possible consistent with obtaining solid castings free from cold shuts. Possibly with the thin-section casting you may not be able to decrease the pouring temperature from the present range, but it would be worth a trial.

Another practice which is used with more or less success is addition of 1 or 2 per cent aluminum to the brass. The aluminum forms an oxide skin over the surface of the melt which reduces fume evolution. However, the oxide skin may be broken up by turbulence in pouring, etc., and lead to inclusions in the casting. Use of phosphorus is not necessary with yellow brasses, and definitely should not be used with aluminum.

Some foundrymen find that use of a heavy cover of broken glass reduces fuming. The brass is melted under a glass cover, and just before pulling the pot more glass is added to provide a stiff, viscous mass. The pot is pulled, and a hole poked through the cover at the lip for egress of the molten metal. Others employ a refractory disk which is allowed to float on top of the molten metal in the pot. The disk acts as a skimmer, tending to coagulate the zinc oxide.

Trouble with Aluminum Rolls

Q.—We will appreciate receiving any data concerning the best recommended practice for casting aluminum rolls for wallpaper industry. Rolls range from 5 to 8 in. OD and 21½ to 31 in. long. Ends of the rolls are closed except for a 2-in. core print. Metal thickness is ½-in. Alloy contains 8 per cent Cu and 4 per cent Sn. Sand castings are rough turned and engraved with various designs for printing wallpaper. Problem is porosity, sometimes apparently due to presence of gas, and at other times a coarse-grain, rough surface is exposed on rough machining. Castings are poured in a horizontal position with fairly heavy risers at both ends, sprue being located at one side of the roll at the center with runners leading to the risers. Molding sand is kept on the dry side, and metal is poured at 1275° F. Dry sand core made in a split box and pasted, forms interior of the roll. What gating would you suggest to aid in more uniform feeding and directional solidification? Would it be advantageous to attempt casting the rolls on end? Also are there any instances known of the use of iron chill molds in quantity production of such an item?

A.—Without specimens to examine it is difficult to offer a definite solution to your problem. You mention that you are using sand on the dry side, and we presume you are exercising proper precautions in melting to eliminate the pickup of gas during that operation. Possibly the use of one of the gaseous or dry degasifying materials might aid in overcoming some of the trouble. However, we believe that the core might be a source of the porosity in that the gas generated does not escape quite readily enough, and permits a slight but definite agitation or disturbance of the metal.

You do not mention any trouble with removing the core from the interior of the rolls which would indicate that the sand is open. However, it is possible that the vent is not large enough. We would suggest trying a piece of 2-in. perforated pipe as an arbor making the core in the form of two half-shells which are pasted along the edges after placing on the arbor. Use minimum amount of paste and be sure that it is perfectly dry before placing core in the mold. To make doubly sure that the gas escapes vents should be scratched across the mold joint to the flask joint.

Your job would be much simpler if the roll were cast as a cylinder, the ends made separately, and bolted in later. In that way a large vent could be placed in the center, not to mention that you would not have to depend on a 2-in. print for support.

We do not know of any foundry making such rolls in chills, and have an idea that it would not be too successful due to the thin section. While large diesel pistons are cast vertically in permanent molds, the molds have to be maintained around 500 to 600° F, and the gate extends the whole height of the cavity. If you want to try chilling, we suggest that you try placing them on the core, using chills with serrated or corrugated faces about 1⅜-in. square and ½-in. thick. They cannot be any larger than mentioned or they will not come through the 2-in. core print hole without a great deal of trouble.

Casting the rolls on end through a ring of ⅜-in. pencil gates would save considerable metal over your present method, if it would work. One difficulty would be from the tendency of aluminum to fold-in and form inclusions when agitated. Experimentally you might try casting on end using a slot gate extending the whole height of the casting cavity. Between sprue and gate place a strip of perforated steel sheet such as used for strainer or skimmer gate construction. That will act not only as a choke but as a cleaner for the metal, preventing the entrance of dross or inclusions into the mold cavity. Instead of forming the sprue in sand you might try a plaster of paris or gypsum cement sleeve incorporating the slot gate and strainer. Since gypsum is an insulating material, you might be able to reduce the size of sprue and gate to a minimum—say 1-in. diam sprue and ¼-in. slot.

Use Cupola in Small Foundry

Q.—We are starting a small gray iron foundry 20 x 40 ft, and on account of extremely limited capital are improvising or building as much of the equipment as possible. The cupola shell is about 7 ft high and is lined to a diameter of 20 in. Air enters through two oval-shaped tuyeres about 3 in. across the wide diameter. The tuyere doors have no peep hole. We shall appreciate your advice on the proper size of blower, weight of charges and other factors required to produce iron hot enough for sharp work.

A.—Under proper operating conditions a 20-in. diameter cupola has a melting capacity of approximately 3000 lb per hour. The blower should deliver 600 cfm at a pressure of 8 oz. Your two small tuyeres might serve for short heats, but if the furnace is to run an hour or more, they are too small. The cupola will work more satisfactorily with four plain rectangular tuyeres 3 x 6 in. To supply these tuyeres the cupola should have a wind belt around the outside with a 6-in. diam blast pipe leading to the blower.

Without a peep hole to the tuyeres, close attention must be paid to the time between taps. Amount of metal collected in the well will depend on the height of the tuyeres above the sand bottom. With the bottom of the tuyeres 10 in. above the bottom, the well will hold approximately 330 lb. A suitable charge for the cupola includes 400 lb pig iron and scrap, broken into small pieces; 50 lb coke and 8 lb limestone. In the beginning the bed can extend 40 in. above the tuyeres. Later, bed and coke splits may be reduced gradually until a change is noted in the temperature of the iron coming from the spout. Since presumably you have no instruments or gages, a certain amount of close experiment and observation will be necessary until you hit on the proper combination of air, metal and fuel for best results.

Roast Clay To Form Chamotte

Q.—We shall appreciate any information you may have on a fire clay known as "chamotte," which we understand is used extensively in English foundries.

A.—We regret that we know of no source of supply for the steel foundry facing known as "chamotte." The main reason is that the material is not used on this side of the Atlantic. Although used to a limited extent in England, it is not an English product. The following is taken from a series of four articles in THE FOUNDRY, August, September, October, November, 1933, dealing with a report submitted by a naval officer on a comparison of American and European steel foundry practice.

"In the majority of continental European foundries visited a mixture known as 'chamotte' is used for facing the molds. A somewhat similar mixture known as 'compo' is used in British foundries. Chamotte is a clay roasted at a high temperature, resulting in a very refractory product. The roasted clay is ground to the required fineness and mixed with green clay binder in the proportion of six parts chamotte to one part clay. Ground to a fine powder it is used as a mold wash."

GANGWAY!

By J. A. PATTERSON

"Say, do you guys smell something burning?"

AFA Philadelphia Convention Program

Rapidly Taking Shape

INCREASING recognition of the importance of the foundry market is indicated in the large number of advance applications for exhibit space at the 1948 Foundry Congress and Show of the American Foundrymen's Association — Philadelphia, May 3-7—received prior to the first assignments of space Dec. 15.

Secretary-Treasurer William M. Maloney reports that many manufacturers who never before displayed their products to the castings field, and many who have not participated in AFA shows for a number of years, are included among those who will exhibit at Philadelphia.

In the technical program the specific and general interest, round-table and shop-course sessions of the five-day meeting will also reflect present conditions within the industry.

AFA's Foundry Cost Committee will present a question-and-answer program dealing with specific cost problems of general interest, methods of cost accounting, distribution of costs, and application of information derived from cost accounting. Questions will be solicited by the committee, which is headed by Ralph L. Lee, comptroller of Grede Foundries, Inc., Milwaukee, and will be answered by members of the group. The committee will sponsor a second session to deal fully with all questions considered of particular interest.

A question-and-answer panel will also be featured at one of the two meetings sponsored by the society's Refractories Committee; the Plant and Plant Equipment group will offer a discussion of innovations in foundry mechanization, with particular reference to small foundries, and the Heat Transfer Committee will present four technical papers.

The tentative convention program reveals that, as in past years, sessions have been so organized that delegates will be able to attend the maximum number concerning their particular field of interest in the minimum number of days. On Philadelphia Day, Tuesday, they will be able to visit the exhibit halls until 9 in the evening; however, on Wednesday morning, when the annual business meeting will be held, exhibits will not open until 11. They will open at 9 other mornings, and close at 5:30 p.m. Monday, Wednesday and Thursday, 4:30 p.m. Friday.

Aluminum and magnesium, brass and bronze, educational, and malleable meetings will be held Monday and Tuesday, May 3rd and 4th; those of the Sand Division, except for the shop course series, Wednesday and Thursday, and of the Pattern Division, Tuesday and Wednesday.

CONVENTION AND EXHIBITS SCHEDULE

(Tentative)

Monday, May 3

8:30 a.m.—Registration begins. Exhibits open.
10-12 noon—Technical sessions—Educational; Aluminum and Magnesium.
12 noon — Brass and Bronze round-table luncheon.
2-4 p.m.—Technical sessions—Aluminum and Magnesium; Malleable.
4-6 p.m. — Technical sessions—Brass and Bronze.
5:30 p.m. — Registration closes. Exhibits close.
6:30 p.m.—Educational Division dinner.
8-10 p.m.— Technical sessions — Gray Iron Shop Course; Sand Shop Course.

Tuesday, May 4

9 a.m.—Registration opens. Exhibits open.
10-12 noon — Technical sessions — Aluminum and Magnesium; Malleable.
12 noon—Aluminum and Magnesium round-table luncheon; Malleable round-table luncheon.
2 p.m.—*Philadelphia Day* opens.
2-4 p.m. — Technical sessions — Brass and Bronze; Pattern; Heat Transfer.
5:30 p.m.—Registration closes.
7 p.m.—Chapter Officers' and Directors' dinner.
8-10 p.m. — Technical sessions — Plant and Plant Equipment; Gray Iron Shop Course; Sand Shop Course.
9 p.m.—Exhibits close.

Wednesday, May 5

9 a.m.—Registration opens.
9:30-10:15 a.m.—Annual business meeting.
10:15-12 noon—Annual lecture.
11 a.m.—Exhibits open.
12 noon—Pattern round-table luncheon. Engineering School Graduates luncheon.
2-4 p.m.—Technical session—Refractories.
4-6 p.m.—Technical session—Sand.
5:30 p.m. — Registration closes. Exhibits close.
7 p.m.—Canadian dinner.
8-10 p.m. — Technical sessions — Gray Iron Shop Course; Sand Shop Course; Refractories.

Thursday, May 6

9 a.m.—Registration opens. Exhibits open.
10-12 noon—Technical sessions—Job Evaluation and Time Study; Gray Iron; Steel.
12 noon—Steel round-table luncheon.
2-4 p.m. — Technical sessions — Cost; Gray Iron.
4-6 p.m.—Technical sessions—Job Evaluation and Time Study; Sand.
5:30 p.m. — Registration closes. Exhibits close.
7 p.m.—Alumni dinner.
8-10 p.m. — Technical sessions — Gray Iron Shop Course; Sand Shop Course.

Friday, May 7

9 a.m.—Registration opens; Exhibits open.
10-12 noon—Technical sessions—Gray Iron; Steel.
2-4 p.m. — Technical sessions — Gray Iron; Steel.
4:30 p.m. — Registration closes. Exhibits close.
7 p.m.—Annual banquet.

Topics of the Steel Division and of the Gray Iron Division—other than the shop course lectures — will be covered Thursday and Friday.

The popular and informal shop courses will be presented at 8 in the evening, Monday through Thursday. Recommended practices for gray iron, malleable, steel and nonferrous castings plants will be covered at the sand meetings. The gray iron shop session topics are: Relationship of cupola coke to carbon control; the effect of blast variation on cupola control; front slagging of the cupola, and factors affecting iron fluidity.

Other technical program highlights include the Australian and British exchange papers—"The Raw Material of the Australian Foundry Industry," by H. A. Stephens, Council of Scientific and Industrial Research, and "Contraction and Distortion in Ferrous Casting," by E. Longden of P. R. Jackson & Co. Ltd., Manchester, England, respectively.

Featured on the aluminum and magnesium program are such topics as the aging of a magnesium casting alloy, stress analysis of light metals castings and an analysis of an aluminum casting alloy series. Light metal foundrymen will be particularly interested in the Charles Edgar Hoyt Annual Lecture, on "The Control of Grain Size in Magnesium Castings." Charles E. Nelson, technical director of the magnesium division of Dow Chemical Co., Midland, Mich., is the lecturer.

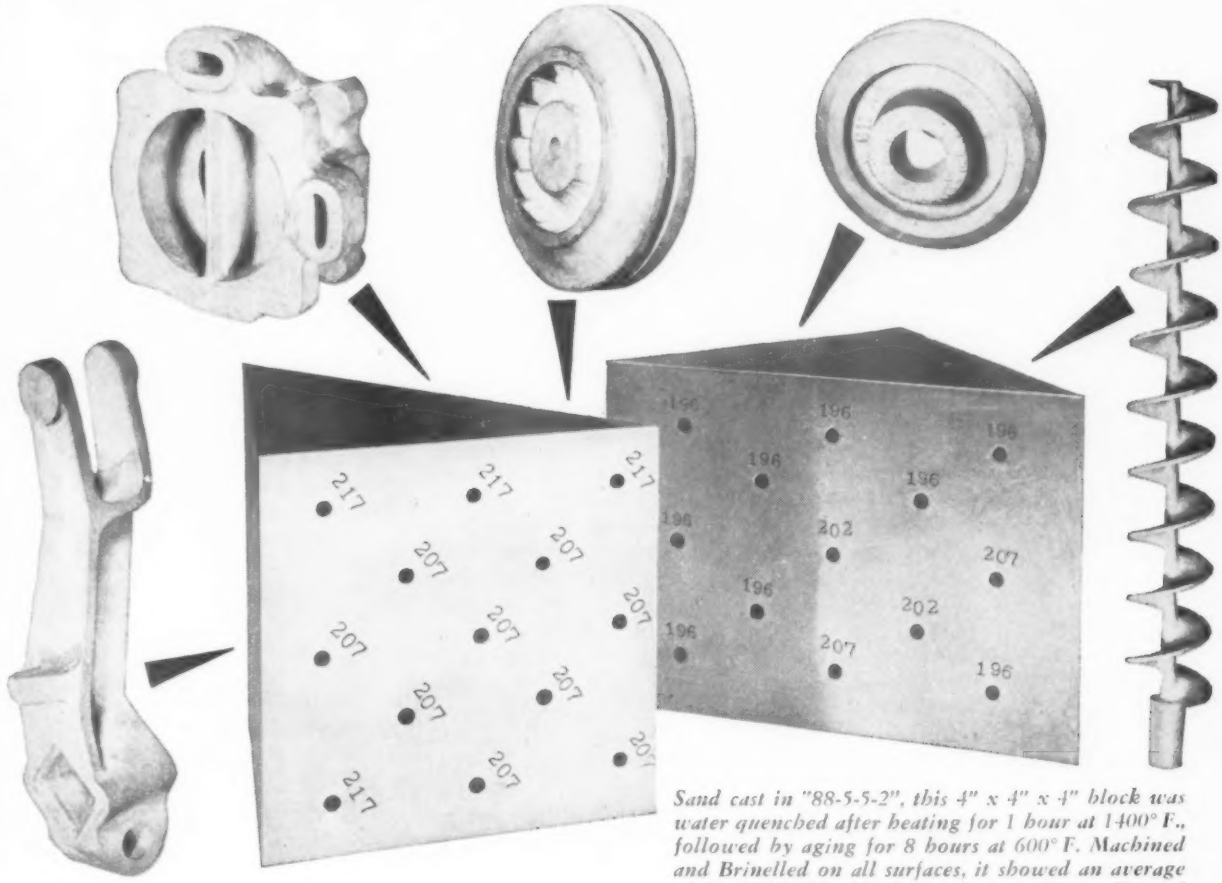
A special series of lectures on quality control test procedures, sponsored by the Annual Lecture Committee of AFA, is also expected to attract large numbers of foundrymen. Recommended practices for brass, bronze and nickel alloys, gray iron, aluminum and magnesium, malleable iron and steel will be covered.

Speakers are William Romanoff, vice president of H. Kramer & Co., Chicago; Fred J. Walls, Detroit office manager, International Nickel Co.; E. V. Blackmun, chief works metallurgist for Aluminum Co. of America, Cleveland; Myron O. Booth, manager of the Saginaw, Mich., malleable plant of the Central Foundry Division, General Motors Corp.; John Juppenlatz, chief metallurgist of Lebanon (Pa.) Steel Foundry.

AN AGE-HARDENABLE

NICKEL-BRONZE

DEVELOPED FOR HEAVY DUTY SERVICE



Sand cast in "88-5-5-2", this 4" x 4" x 4" block was water quenched after heating for 1 hour at 1400° F., followed by aging for 8 hours at 600° F. Machined and Brinelled on all surfaces, it showed an average of 209 BHN. The block was then cut diagonally, and both interior surfaces averaged 197 BHN.

Specify "88-5-5-2" (Copper-Tin-Nickel-Zinc) where you want corrosion-resistant bronze castings with extremely high mechanical properties.

This alloy in the "as-cast" condition serves the same purposes as "G" Bronze, but that's not the whole story.

The excellent physical properties of "88-5-5-2" may be immensely improved by heat treating . . . as exemplified by the block shown above.

The Nickel content provides the age-hardening response which increases both tensile and compressive strength, being particularly effective in raising the elastic properties. Nickel also increases fluidity in the casting mixture, thus affording a widened casting range that helps to minimize misruns and improves density and pressure-tightness.

This age-hardening Nickel-bronze meets wide demands. Philadelphia Bronze and Brass Corp., maker of the parts illustrated, produces "88-5-5-2" castings that range in size from ½" x 12" bars to parts weighing over 500 pounds.

EMBLEM OF INCO SERVICE
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes and other alloys containing Nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

MEN of Industry

W. E. DAY chief metallurgist and general foundry superintendent, Mack Trucks Inc., New York, has been appointed director of research. In 1912 Mr. Day joined International Motor Co., Plainfield, N. J., now part of Mack-International Motor Truck Corp. Much of his early experience was in the testing division. He became interested in metallurgy during this period and after taking courses at Harvard University, set up Mack's first chemical laboratory for checking materials, out of which he evolved the present chemical and metallurgical laboratories. Mr. Day was a member of the advisory committee on alloy steels, War Production Board, during the recent war. He is at present chairman of the Nonferrous Metals Standards Committee and a past chairman of the Metropolitan Chapter of the American Foundrymen's Association.

♦ ♦ ♦

Harry E. Orr, formerly general manager of operations, Vanadium Corp. of America, New York, has been appointed assistant vice president and manager of district sales. Mr. Orr will be in direct charge of the Chicago sales district with headquarters there, in addition to supervising other sales districts of the corporation. **D. G. Bowser,** formerly metallurgical assistant to the executive vice president, succeeds Mr. Orr as general manager of operations, and will be located at Niagara Falls, N. Y.

♦ ♦ ♦

W. S. Kendrick, for 25 years vice president in charge of sales, General Electric X-Ray Corp., Chicago, has been appointed to the president's staff to handle special assignments. Mr. Kendrick joined the parent company, General Electric Co., 40 years ago and for several years headed the special products department which sought markets for new inventions developed at the research laboratory, Schenectady. **John H. Smith,** who recently joined General Electric X-Ray Corp. as assistant to President **J. H. Clough,** has been named vice president in charge of the recently created Marketing Division which centralizes supervision of sales, merchandising, products and services. Mr. Smith was graduated from University of Pennsylvania and was formerly assistant sales manager, General Cable Corp., New York, and prior to that procurement manager of Cramp Ship Building Co., Philadelphia.

♦ ♦ ♦

E. L. Ramsey, who retired recently as superintendent of steel production, Wisconsin Steel Division, International Harvester Co., Chicago, has been appointed technical consultant, Miller & Co., with headquarters in its Chicago office. Mr. Ramsey has been associated with steel companies throughout the country since 1901, specializing in development of open-hearth steel process methods. In his new appointment he will continue his interest in development of practices for new alloys and deoxidizers.

♦ ♦ ♦

J. A. Wotherspoon has organized J. A. Wotherspoon & Son Ltd., Oakville, Ont., which will operate a foundry to produce soil pipe and fittings. For many years Mr. Wotherspoon was associated with Anthes-Imperial Ltd., Toronto, and its subsidiary companies, Anthes Foundry Ltd., Toronto and Winnipeg, Man., and Imperial Iron Corp. Ltd., St. Catharines, Ont. He served as chairman of the Ontario chapter, AFA, during 1946-47.

♦ ♦ ♦

Dr. Thomas P. May has joined the corrosion engineering section of the Development and Research Division, International Nickel Co. Inc., New York. Dr. May holds chemical engineering and master of science degrees from Catholic University, where he received his Ph. D. degree in 1940. Since that time he has been head of the corrosion section, Chemistry Division, U. S. Naval Research Laboratory, Washington.

♦ ♦ ♦

J. A. Havnen has been appointed assistant foundry superintendent, Wells Mfg. Co., Skokie, Ill. Mr. Havnen, until recently, was foundry superintendent, Flour City Ornamental Iron Co., Minneapolis. Prior to Army service he was associated with Lynchburg Foundry Co., Lynchburg, Va.

♦ ♦ ♦

Bern Dibner, formerly vice president and general manager, Burndy Engineering Co., New York, has been

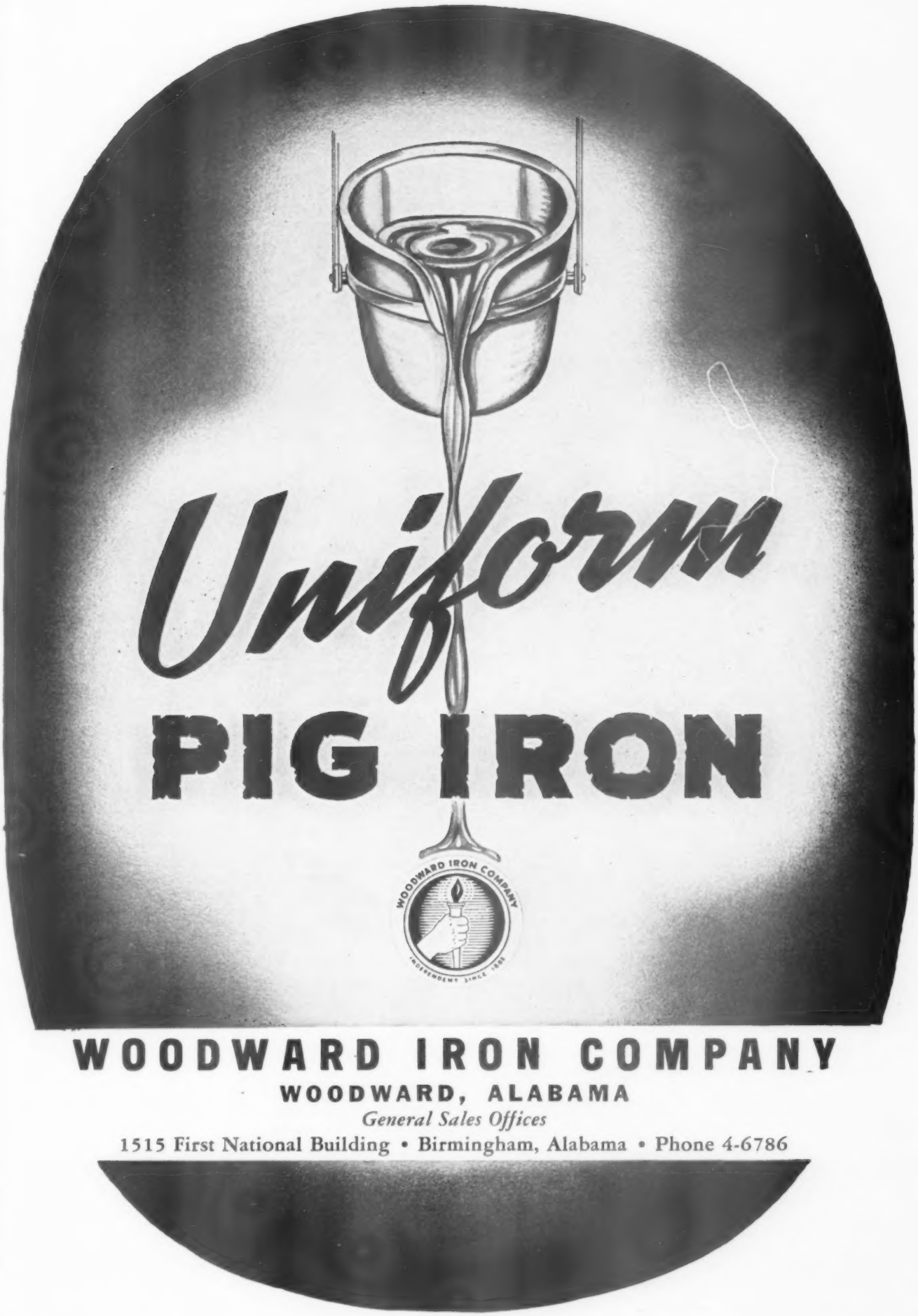
(*Continued on page* 106)

W. E. DAY

HARRY E. ORR

W. S. KENDRICK

E. L. RAMSEY



WOODWARD IRON COMPANY

WOODWARD, ALABAMA

General Sales Offices

1515 First National Building • Birmingham, Alabama • Phone 4-6786

(*Continued from page* 104)
elected president, succeeding the late Philip Fried.

♦ ♦ ♦

E. M. Sarraf, for the last year Cleveland assistant district sales manager, Harbison-Walker Refractories Co., Pittsburgh, has been appointed district sales manager in the Cleveland territory. Mr. Sarraf, who holds a master's degree in chemical engineering from University of Pittsburgh, joined the Harbison-Walker laboratories in 1926, devoted his time to the technical department until 1935, when he entered the Cleveland sales offices.

♦ ♦ ♦

W. E. Odom and **J. E. Nyhan,** for many years connected with the field of industrial relations, have organized Odom & Nyhan, 20 North Wacker Drive, Chicago, and will continue as consulting industrial engineers. Mr. Odom, a graduate electrical engineer, is the founder and manager of William Odom Associates. He is a member of the American Society of Metallurgical Engineers, a founder member of the Association of Professional Engineers and past president of the Industrial Management Society. Mr. Nyhan spent nearly 12 years as assistant to the president of the National Founders Association and was national secretary of the National Metal Trades Association for 10 years. His technical and practical background is in the mechanical engineering field. The new partnership will assist management in establishing or modifying personnel policies and procedures to cope with industrial and labor relations as they change in current operations.

♦ ♦ ♦

Anthony J. Zino Jr., who has been eastern manager of the lubrication department, E. F. Houghton & Co., Philadelphia, since 1942, has been appointed assistant sales manager of the Industrial Sales Division, Swan-Finch Oil Corp., with headquarters in the New York home office. Mr. Zino was graduated from Case Institute of Technology, and was sales engineer and New York sales manager, Lubri-Zol Corp., Wickliffe, O., for 8 years, where his experience included extensive field research on development of additives and treated oils. His new duties will include developing uses for industrial lubricants, cutting and drawing compounds.

♦ ♦ ♦

Eugene Conreaux, for the last 2 years sales and service representative, the Beardsley & Piper Co., Chicago,

EUGENE CONREAUX

has been appointed field representative in the foundry division, Illinois Cereal Mills Inc,, Paris, Ill. Mr. Conreaux was in the sand testing department of American Steel Foundries, Granite City, Ill., from 1933-1944, and then spent a year in the sand and coreroom division, the Key Co., East St. Louis, Ill. In his new appointment with Illinois Cereal Mills, he will work with foundries on coreroom problems, and assist and supervise in the running of tests on sand and coremaking problems.

♦ ♦ ♦

James G. Weber, until recently development manager, casting and sales engineer, Ampco Metals Inc., Milwaukee, has been appointed sales manager, Engineering Service Inc., Milwaukee. Mr. Weber was graduated from Marquette University where he remained 2 years as an instructor in mechanical engineering. He was associated with Allis-Chalmers Mfg. Co., Milwaukee, for 4 years as a service and erecting engineer and joined Ampco Metals 5 years ago. In 1943 he was cited by the War Production Board for centrifugal casting machine design, operations and general foundry engineering. Mr. Weber has been a member of the Wisconsin Chapter, AFA, since 1942.

♦ ♦ ♦

G. Edward Conn Jr. has been appointed manager of the newly established York, Pa., branch office of Allis-Chalmers Mfg. Co., Milwaukee. Mr. Conn, a graduate of Drexel Institute of Technology, joined Allis-Chalmers in 1940 and has been a salesman in its Philadelphia district office since 1943. **MacGregor G. Jones,** formerly resident representative at the Harrisburg, Pa., branch office, which has been discontinued, will assist Mr. Conn at York as sales representative.

♦ ♦ ♦

Charles D'W. Gibson and **John A. Hill,** vice presidents, Air Reduction Co. Inc., New York, have been elected directors. Mr. Gibson, a graduate of Union College, joined Air Reduction as a salesman in 1919. He managed the Richmond, Va., and Detroit sales districts and was appointed assistant vice president and general sales manager in 1926. Since 1937 he

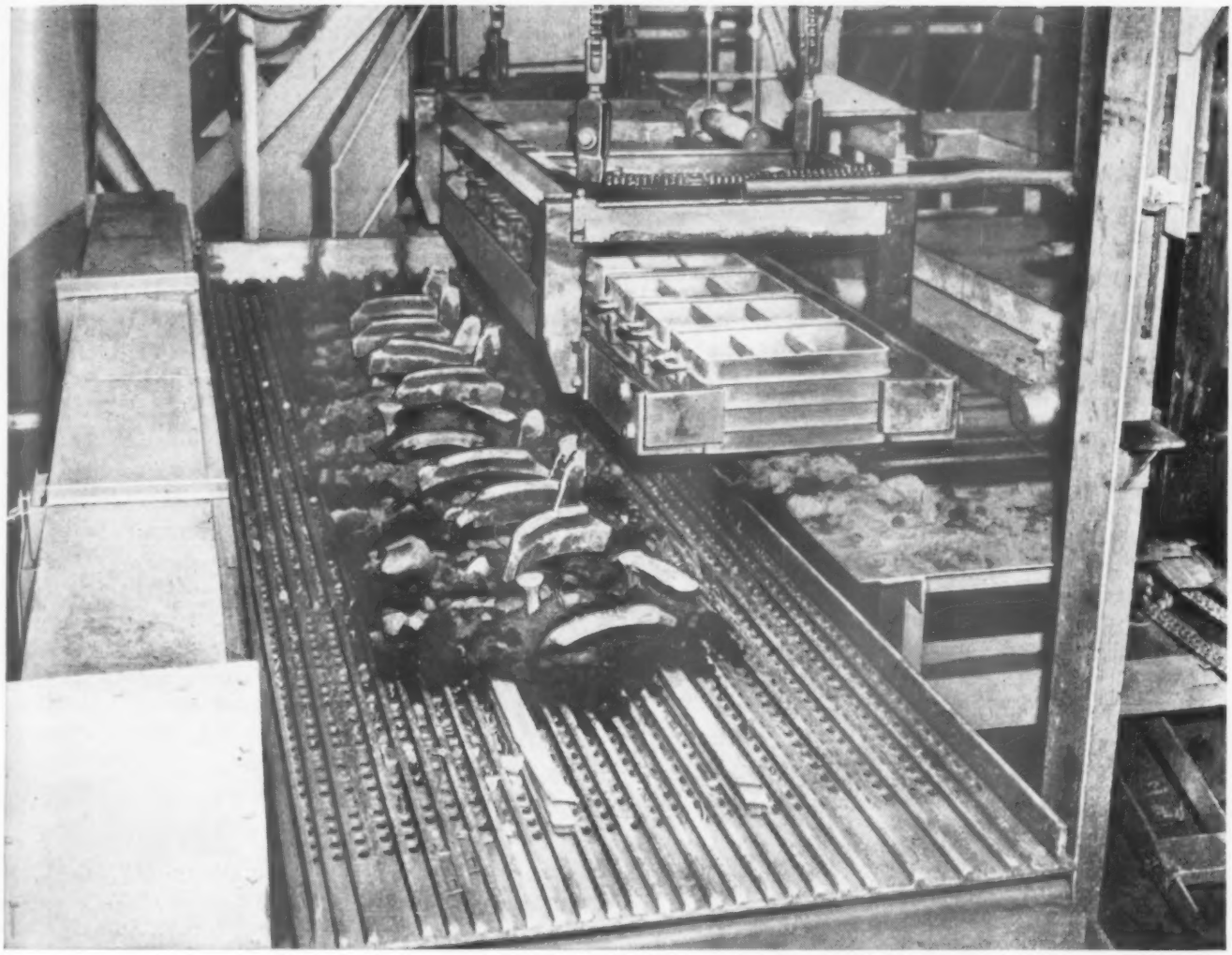
(*Concluded on page* 110)

E. M. SARRAF

J. E. NYHAN

W. E. ODOM

ANTHONY J. ZINO, JR.



Shake down your foundry production costs!

Use modern methods . . . modern machinery. Machinery such as the modern *horizontal* self-discharging Robins Floatex Shakeout.

This unit is flexible . . . adapts itself to all types and classes of work where *mechanical* discharging will speed up production, increase output.

In the photo, eleven flasks delivered by a special grab are being handled as one operation. Placed on the Floatex, the flasks are shaken out. Sand passes through the perforated deck, while castings move briskly toward the discharge end. The adhering sand is thoroughly knocked out on the way.

On this Robins Floatex Shakeout, the deck is horizontal. *Discharge is entirely mechanical.* This is due to the exclusive elliptical motion, inclined to the horizontal. Its vertical component empties the flask, cleans the castings. Its horizontal component assures positive self-discharge off the end.

Like all Robins Floatex Shakeouts, this unit is full-floating. The vibrating deck is supported on soft, heavy-duty coil springs which prevent impact damage to mechanism or castings and eliminate the transmission of vibration into supporting structures. This Robins Floatex Shakeout shakes the flask, not the building!

Plan now to shake down *your* production costs. Let a Robins engineer show you how. Write for full particulars today.

ROBINS CONVEYORS DIVISION . . . Hewitt-Robins Incorporated, Passaic, New Jersey

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3 TYPES DESIGNED TO HELP YOU 6 WAYS:

1. Save Time
2. Reduce Labor
3. Help Sand Recovery
4. Cool Hot Sand
5. Minimize Flask Breakage
6. Improve Working Conditions

NEW LITERATURE

TO THE MAN WITH

Gray iron, Steel, Malleable and Non-Ferrous Foundries will find the new American series of illustrated bulletins of particular value in the profitable solution of their individual metal cleaning problems. Each bulletin describes the principle of the Airless Wheelabrator Blast Cleaning Method. It shows that by utilizing centrifugal force in hurling abrasive the Airless Wheelabrator effects huge savings in power; that the Wheelabrator throws more abrasive and throws it harder per horsepower expended than any other blasting device ever conceived; that the Wheelabrator scours away every trace of sand and scale right down to the virgin metal, bringing out its natural brilliance and lustre.

Each of these bulletins points out the advantages in using a cleaning machine that is the right size and type for the job to be done. It backs up all claims of faster cleaning and lower costs with actual case histories.

Profusely illustrated throughout, these bulletins con-

WORLD'S LARGEST BUILDERS OF AIRLESS

OF IMPORTANCE
BLAST CLEANING PROBLEMS

tain pictures of the machines in operation and the many products that are now being profitably cleaned.

Finally, there is an invitation extended in each bulletin for you to take advantage of the Wheelabrator testing laboratory in the solution of your cleaning problems. Built and equipped at a cost of nearly a quarter of a million dollars, it is the largest and most complete department of its kind in the blast cleaning industry. It is in this laboratory that we can show you how Wheelabrating will do your job faster, better, and cheaper.

Fill out and mail the coupon below indicating which of these four bulletins will be most helpful to you.

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Faster Production

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Please send me the literature checked on

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- ☐ in the Malleable Foundry
- ☐ in the Gray Iron Foundry
- ☐ in the Non-ferrous Foundry

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

(*Concluded from page* 106)

has been vice president in charge of sales. Mr. Hill attended Amherst College and was graduated from Columbia Law School in 1928. Formerly secretary of Air Reduction, he became vice president 2 years ago.

♦ ♦ ♦

Norman L. Deuble has joined the metallurgical engineering staff, Climax Molybdenum Co., New York. For the last 4 years Mr. Deuble has been with M. W. Kellogg Co., Jersey City, N. J., in charge of special processes and of work in the high temperature laboratory. He spent 2 years in the Steel and the Aircraft Production Divisions, War Production Board, Washington, and prior to that was sales manager, the Copperweld Steel Co., Warren, O. Mr. Deuble was active for 20 years in alloy steel metallurgy with Republic Steel Corp. and its predecessor, the United Alloy Steel Corp.

♦ ♦ ♦

W. T. McCargo, formerly eastern regional sales manager, the Carborundum Co., Niagara Falls, N. Y., has been named assistant director of sales in charge of operations in the western region, with headquarters in Chicago. **John S. Hawley,** who has been manager of the commercial research department at Niagara Falls, has been named assistant director of sales in the central region, with headquarters in Cleveland. **John G. Fritzinger,** district sales manager of the branch at Philadelphia, has been appointed assistant director of sales with jurisdiction over the eastern region and will remain in Philadelphia. **R. R. Huntington** succeeds Mr. Fritzinger as district sales manager there. He was formerly a member of the Cleveland sales staff.

♦ ♦ ♦

N. George Belury, formerly sales manager has been appointed vice president of the Engineered Castings Division of the American Brake Shoe Co. at Rochester, N. Y. Mr. Belury, a graduate of Purdue University, joined the company in 1937. **Harry C. Platt** formerly division metallurgist at Rochester, has been named works manager there. Mr. Platt has been with the company's metallurgical department since 1942 when he was graduated from Massachusetts Institute of Technology.

♦ ♦ ♦

J. F. McQuillan has been appointed superintendent of the Whiting, Ind., plant, Federated Metals Division, American Smelting & Refining Co., New York, succeeding **A. S. Wigle,** who has been made general superintendent of all operations at Whiting, including the Chicago plant. Mr. McQuillan attended Carnegie Institute of Technology and joined American Smelting & Refining Co. in 1929, as a laboratory staff member in Pittsburgh. He became chief metallurgist of the Pittsburgh facility, and from 1941 to January of 1945 was superintendent there, when he was appointed superintendent of the Perth Amboy, N. J., plant.

♦ ♦ ♦

W. T. C. Carpenter, since 1920 first vice president of U. S. Pipe & Foundry Co., East Burlington, N. J., has resigned that office and will continue as a director and member of the executive committee. **F. S. Gordon** succeeds Mr. Carpenter as first vice president. **Gen. Donald Armstrong** has been named executive vice president, a director and executive committee member of the company.

♦ ♦ ♦

V. E. Lysaght has been made sales manager of Andrew C. Campbell Division, (Bridgeport, Conn.,) American Chain & Cable Co., New York, succeeding **R. J. Southwell,** who has resigned. Mr. Lysaght will continue his duties with Wilson Mechanical Instrument Co., New York, another subsidiary of American Chain, where he is in charge of engineering and hardness tester sales.

♦ ♦ ♦

Leighton M. Long of Leighton M. Long & Associates, Toledo, O., has disposed of his holdings in Toledo Smelting & Refining Co., and has resigned from all official capacity. Mr. Long will devote his entire time to foundry consultation work, specializing in the use of permanent molds for making brass and bronze castings.

♦ ♦ ♦

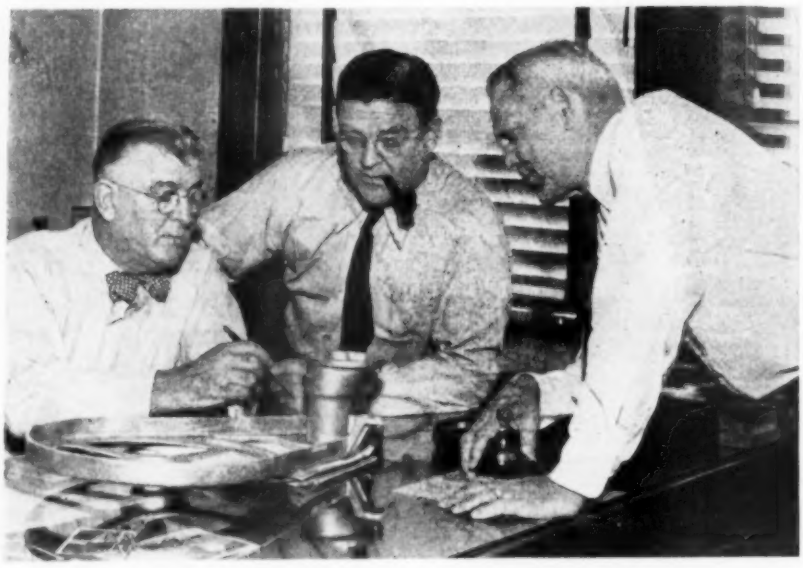
H. J. Held has been named president of Rundle Mfg. Co., Milwaukee, succeeding **E. F. Dobson** who has been appointed president, Florence Stove Co., Gardner, Mass. For the last 9 years Mr. Held has been manager of the Rundle plant at Camden, N. J.

♦ ♦ ♦

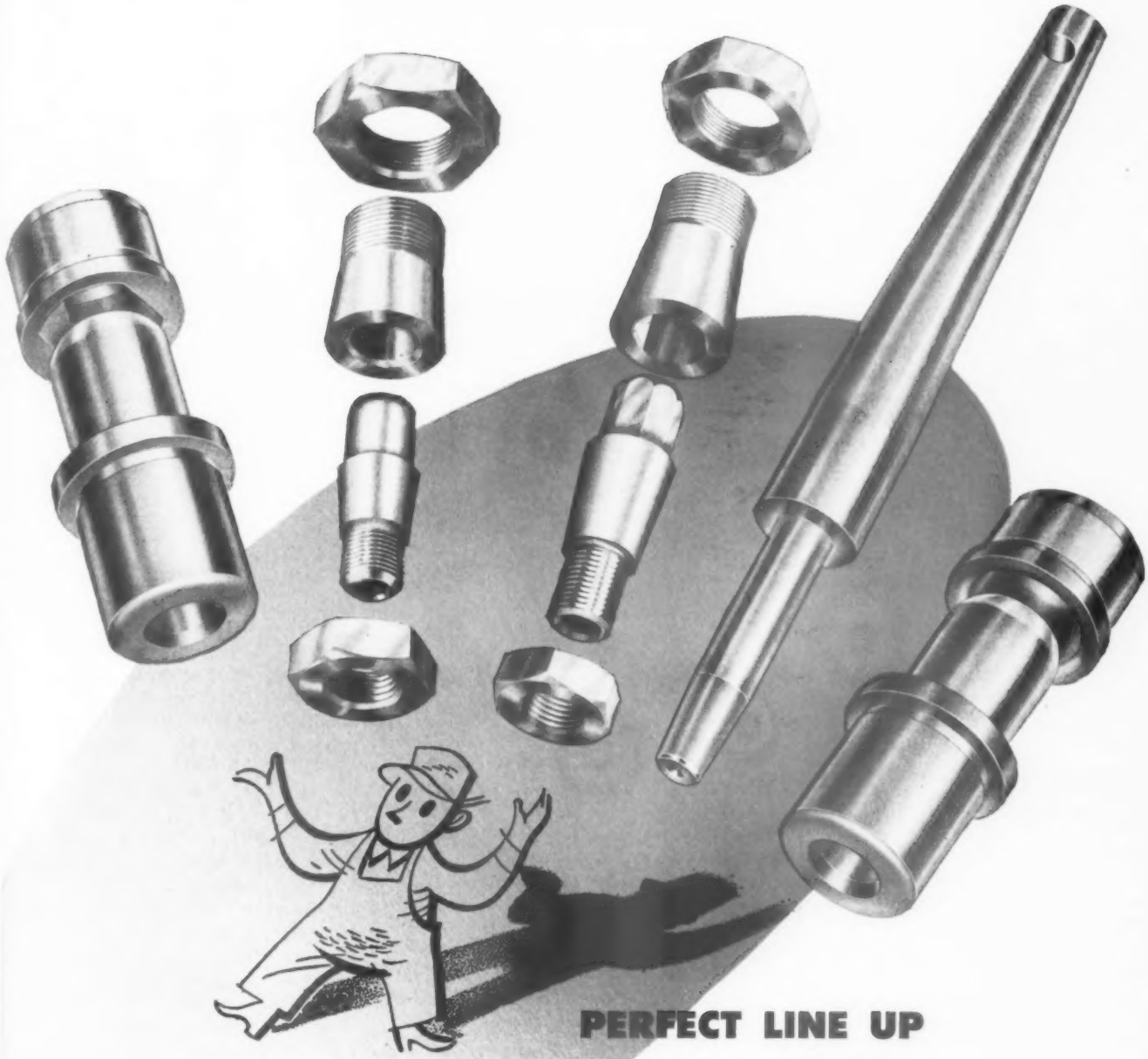
David B. Hill has been appointed district field engineer in the Atlanta office of Chain Belt Co., Milwaukee. Mr. Hill, who joined the company in 1937, was formerly an application engineer in the conveyor division at Milwaukee.

♦ ♦ ♦

Howard G. Gollmar, general manager, Elyria Foundry Division of Industrial Brownhoist Corp., Elyria, O., has been elected to complete the unexpired term of **James E. Davidson,** company director, who died July 25.



SILVER ANNIVERSARY: Last November marked the 25th anniversary of incorporation of the Gluntz Brass Foundry Co., Cleveland. Now known as the Gluntz Brass & Aluminum Foundry Co., the company's present officers are the same as the original ones in 1922. Shown here, left to right, they are: President, Daniel J. Gluntz; secretary-treasurer and sales manager, William A. Gluntz; vice president, L. V. Annable. Although the original Gluntz foundry was destroyed by fire a year after it was started, steady growth since then has provided the company today with capacity for producing 500,000 pounds of nonferrous castings monthly. In addition, pattern and machine shop facilities are operated



PERFECT LINE UP of cope and drag with UNIVERSAL FLASK PINS and BUSHINGS

If you're having trouble with cope and drag line-up on your casting production line and are losing valuable time and metal as a result, *it will pay you to investigate* Universal Flask Pins and Bushings. Precision-made in various standard sizes and shapes, Universal Flask Pins and Bushings can be readily installed in flasks *to insure positive alignment* with minimum effort. Cope bushings are quickly guided to the drag pins over a tapered, loose-fitting closing pin which is easily removed after assembly. Round or elongated bushings and round pin design permits longitudinal expansion resulting from metal heat. *Hardened and ground for lasting accuracy and maximum wear resistance.* Write for folder.

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH, MICHIGAN

(*Continued from page* 114)

are favored by fine-grain structure. Straight silicon-killed steel is less susceptible to graphitization than silicon-aluminum killed steel.

James A. Bowers presented a paper prepared by one of his associates, Sam F. Carter, American Cast Iron Pipe Co., Birmingham, on "Effect of Some Melting Variables on the Tensile Properties of Acid Electric Steel" in which the following points were emphasized: Meltdown should be kept slightly oxidizing to minimize gas absorption and maintain efficent arcing; as soon as melted a high concentration of iron oxide should be produced to lower residual Si and Mn, impart maximum fluidity to inclusions and to reduce solubility for hydrogen; meltdown should be high enough in C to permit considerable C drop and cause evolution of CO over a sufficient period of time to flush out inclusions, H and N without carrying the slag to a low FeO content; for first deoxidant simultaneous Mn and Si proved better than either alone, and heats that finish with slags of intermediate fluidity and FeO content average higher in ductility and tensile quality.

Temperature Should Not Be High

In the discussion E. A. Loria, Mellon Institute of Industrial Technology, Pittsburgh, inquired as to the tendency of silica reduction and the temperature during the boil and blocking. Response was that the temperature should be kept low. With high temperature and a long boil there was a tendency for silica reduction. M. T. McDonough, National Malleable & Steel Castings Co., Sharon, Pa., asked whether silicomanganese had been tried instead of ferromanganese, and Mr. Bowers said that some work had been done without any noticeable difference, but it was not conclusive. J. B. Caine asked whether oreing down a heat from 0.25 to 0.10 C and using high C ferromanganese would function as well as the practice in oreing down from 0.35 to 0.20 C, and the answer was there should be no difference. G. A. Lillieqvist, American Steel Foundries, East Chicago, Ind., said that the use of Ca-Mn-Si instead of FeMn as a deoxidizer gives much better results.

Thursday's session closed with a paper by Clyde Wyman, Burnside Steel Foundry Co., Chicago, and George W. Johnson, Vanadium Corp. of America, Chicago, on "Recovery of Vanadium and Other Alloys in the Acid Electric Furnace." Paper was presented by Mr. Wyman, and indicated that by controlling the FeO in the final stages of the heat, 80 to 90 per cent of the V in the scrap can be recovered, and increased recoveries of Mn and Cr are accomplished. Evidence is that maintaining a higher meltdown and bath carbon content effectively controls the FeO in the bath and retards oxidation of residual alloys. The greater the bath activity, the closer will be the iron oxide equi-

NORMAN I. STOTZ

librium between slag and metal, and the more active a slag can be kept during working of the heat, the cleaner the heat will be tapped.

Friday morning's session, presided over by J. S. Marsh, Bethlehem Steel Co., Bethlehem, Pa., and B. M. Larsen, U. S. Steel Corp. of Delaware, Kearny, N. J., was a joint meeting on metallurgy in acid and basic practice. First paper on "Hydrogen and Nitrogen Contents of Steel as Affect-

JAMES A. BOWERS

ed by Melting Practices" by C. E. Sims and Dr. Moore, Battelle Memorial Institute, Columbus, was given by Mr. Sims. Procedure for determining H content is to place solid sample as soon as it was obtained under mercury and then place it in a hot extraction apparatus where the hydrogen is driven off at 1925°F in about 40 hr. Nitrogen is determined by usual wet method.

Data presented showed that N decreases during the boil in the electric furnace, levels off, and then increases on addition of alloys. However, the N content is not sufficient to affect the physical properties of the steel. With H there is a sharp drop during the first violent boil, a leveling off with a slight increase during the boil, and then an increase with the addition of the alloys. Atmospheric conditions have a marked effect on the amount of H occluded. For example, one heat in the summer with high humidity indicated 0.29-relative volume of H at meltdown which decreased to 0.17-vol. at first violent boil. During the boil H increased to 0.2-vol., and on additions of alloys increased to 0.29-relative volume.

Wet Ladles Cause Trouble

In the fall (October) one heat showed 0.17-relative vol. at meltdown with a drop to 0.10 on the boil, and a final of 0.14-relative vol. In the winter (January) when relative humidity was low one heat showed 0.10-relative vol. H at meltdown with a sharp decrease at first violent boil, and a final relative vol. of 0.12 on tapping. Mr. Sims gave figures showing the increase of H in the ladle where it was improperly dried, and pointed out that efforts to decrease H by furnace manipulation could be nullified entirely by wet or damp ladles. Data presented also indicated that the best method for reduction of H in the furnace is to have a rate of C drop of from 0.5 to 1.0 per cent per hr. On a 6-ton heat with a C drop of 0.8 per cent per hr a low H content was obtained.

Concluding paper at the session was by Georges Ranque, Societe Commentry Fourchambaud, Decazeville, France, on "Rational Process for the Improved Manufacture of Steel Without Inclusions" and was presented in abstract form by Shadburn Marshall, Carnegie-Illinois Steel Corp., Pittsburgh. First section of the paper was devoted to a discussion of the physical chemistry aspects of steelmaking wherein inclusion-forming elements were divided into two types—generative such as O and N, and fixed as Fe, Si, etc.—and the mode of reactions between them described. Second part of the paper described the application to obtain clean steel under operating conditions. Essentially the method is to shape up the heat and then slag off. With high temperature

(*Concluded on page* 121)

JANUARY, 1948 THE FOUNDRY DATA SHEET

OUTSIDE DIAMETERS FOR THE SCRIBING OF POLYGONS

In laying out and making patterns many cases occur where squares, hexagons or octagons must be scribed. The first step in this operation is to lay out a circle of proper diameter inside of which the polygon may be constructed. The accompanying tables give the proper diameters for these circles for polygons ranging from 1-16 to 6 inches across flats.

Distance across flats, inches	Dia. for squares, inches	Dia. for hexagons, inches	Dia. for octagons, inches
1/16	3/32	1/16	1/16
1/8	1/8	1/8	1/8
3/16	3/16	3/16	3/16
1/4	1/4	1/4	1/4
5/16	5/16	5/16	5/16
3/8	3/8	3/8	3/8
7/16	7/16	7/16	7/16
1/2	1/2	1/2	1/2
9/16	9/16	9/16	9/16
5/8	5/8	5/8	5/8
11/16	11/16	11/16	11/16
3/4	3/4	3/4	3/4
13/16	13/16	13/16	13/16
7/8	7/8	7/8	7/8
15/16	15/16	15/16	15/16
1	1 1/16	1 1/32	1 1/16
1 1/16	1 1/16	1 1/16	1 1/16
1 1/8	1 1/8	1 1/8	1 1/8
1 3/16	1 3/16	1 3/16	1 3/16
1 1/4	1 1/4	1 5/32	1 1/4
1 5/16	1 5/16	1 5/16	1 5/16
1 3/8	1 3/8	1 3/8	1 3/8
1 7/16	1 7/16	1 7/16	1 7/16
1 1/2	1 1/2	1 1/2	1 1/2
1 9/16	1 9/16	1 9/16	1 9/16
1 5/8	1 5/8	1 5/8	1 5/8
1 11/16	1 11/16	1 11/16	1 11/16
1 3/4	1 3/4	1 3/4	1 3/4
1 13/16	1 13/16	1 13/16	1 13/16
1 7/8	1 7/8	1 7/8	1 7/8
1 15/16	1 15/16	1 15/16	1 15/16
2	2 1/16	2 1/32	2 1/16
2 1/16	2 1/16	2 1/16	2 1/16
2 1/8	2 1/8	2 1/8	2 1/8
2 3/16	2 3/16	2 3/16	2 3/16
2 1/4	3 1/16	2 5/32	2 3/16
2 5/16	3 1/16	2 5/16	2 5/16
2 3/8	3 3/16	2 3/8	2 3/8
2 7/16	3 3/16	2 7/16	2 7/16
2 1/2	3 5/16	2 1/2	2 1/2
2 9/16	3 5/16	2 9/16	2 9/16
2 5/8	3 7/16	2 19/32	2 5/8
2 11/16	3 7/16	2 11/16	2 11/16
2 3/4	3 9/16	2 3/4	2 3/4
2 13/16	3 9/16	2 13/16	2 13/16
2 7/8	3 11/16	2 27/32	2 7/8
2 15/16	3 11/16	2 15/16	2 15/16
3	3 13/16	2 31/32	2 15/16
3 1/16	3 13/16	3 1/32	3 1/16
3 1/8	3 15/16	3 1/16	3 1/16
3 3/16	3 15/16	3 3/32	3 1/16
3 1/4	4 1/16	3 3/16	3 3/16
3 5/16	4 1/16	3 5/16	3 5/16
3 3/8	4 1/8	3 5/16	3 5/16
3 7/16	4 1/8	3 7/16	3 7/16
3 1/2	4 3/16	3 7/16	3 7/16
3 9/16	4 3/16	3 17/32	3 7/16
3 5/8	4 5/16	3 5/8	3 5/8
3 11/16	4 5/16	3 11/16	3 11/16
3 3/4	4 5/16	3 3/4	3 11/16
3 13/16	4 7/16	3 25/32	3 3/4
3 7/8	4 7/16	3 7/8	3 13/16
3 15/16	4 7/16	3 15/16	3 13/16
4	4 9/16	4	3 13/16
4 1/16	4 9/16	4 1/32	3 15/16
4 1/8	4 11/16	4 1/16	3 15/16
4 3/16	4 11/16	4 3/32	4
4 1/4	4 11/16	4 1/8	4
4 5/16	4 13/16	4 5/32	4 1/16
4 3/8	4 13/16	4 3/16	4 1/16
4 7/16	4 13/16	4 7/32	4 1/16
4 1/2	4 15/16	4 1/4	4 1/8
4 9/16	4 15/16	4 9/32	4 1/8
4 5/8	4 15/16	4 5/16	4 1/8
4 11/16	5 1/16	4 11/32	4 3/16
4 3/4	5 1/16	4 3/8	4 3/16
4 13/16	5 1/16	4 13/32	4 3/16
4 7/8	5 3/16	4 7/16	4 5/16
4 15/16	5 3/16	4 15/32	4 5/16
5	5 3/16	4 1/2	4 5/16
5 1/16	5 5/16	4 17/32	4 7/16
5 1/8	5 5/16	4 9/16	4 7/16
5 3/16	5 5/16	4 19/32	4 7/16
5 1/4	5 7/16	4 5/8	4 9/16
5 5/16	5 7/16	4 21/32	4 9/16
5 3/8	5 7/16	4 11/16	4 9/16
5 7/16	5 9/16	4 23/32	4 11/16
5 1/2	5 9/16	4 3/4	4 11/16
5 9/16	5 9/16	4 25/32	4 11/16
5 5/8	5 11/16	4 13/16	4 13/16
5 11/16	5 11/16	4 27/32	4 13/16
5 3/4	5 11/16	4 7/8	4 13/16
5 13/16	5 13/16	4 29/32	4 15/16
5 7/8	5 13/16	4 15/16	4 15/16
5 15/16	5 13/16	4 31/32	4 15/16
6	5 15/16	5	5

Distance across flats, inches	Dia. for squares, inches	Dia. for hexagons, inches	Dia. for octagons, inches
2 1/16	3 5/8	2 3/32	2 3/32
2 5/8	3 11/32	3 1/32	2 3/32
2 1/8	3 3/16	3 3/32	2 3/32
2 3/4	3 3/16	3 1/16	2 3/32
2 13/16	3 3/16	3 1/8	2 3/32
2 7/8	4 1/16	3 5/16	3 3/32
2 15/16	4 5/32	3 3/16	3 1/16
3	4 1/4	3 5/32	3 1/4
3 1/16	4 5/16	3 5/16	3 5/16
3 1/8	4 5/16	3 3/8	3 5/16
3 3/16	4 1/2	3 1/16	3 3/32
3 1/4	4 1/32	3 3/4	3 3/32
3 5/16	4 1/16	3 3/32	3 3/32
3 3/8	4 1/16	3 3/32	3 3/32
3 7/16	4 3/16	3 3/16	3 3/32
3 1/2	4 3/16	4 3/32	3 3/32
3 9/16	5 3/32	4 3/32	3 3/32
3 5/8	5 1/8	4 1/16	3 3/32
3 11/16	5 3/32	4 1/32	3 3/32
3 3/4	5 1/32	4 3/32	4 1/16
3 13/16	5 3/32	4 3/32	4 1/8
3 7/8	5 1/32	4 1/32	4 1/16
3 15/16	5 1/16	4 3/32	4 1/16
4	5 1/32	4 5/32	4 1/16
4 1/16	5 3/16	4 1/16	4 3/32
4 1/8	5 3/32	4 1/32	4 1/32
4 3/16	5 3/32	4 3/32	4 1/32
4 1/4	6 1/16	4 1/32	4 1/32

Distance across flats, inches	Dia. for squares, inches	Dia. for hexagons, inches	Dia. for octagons, inches
4 1/16	6 3/32	4 3/32	4 3/32
4 3/8	6 1/16	5 1/32	4 3/32
4 7/16	6 3/32	5 1/8	4 3/32
4 1/2	6 3/32	5 1/32	4 3/8
4 5/16	6 3/32	4 3/32	4 1/32
4 5/8	6 3/32	5 1/32	5 1/32
4 11/16	6 5/8	5 1/32	5 1/16
4 3/4	6 3/32	5 3/32	5 1/16
4 13/16	6 3/32	5 1/32	5 1/32
4 7/8	6 3/32	5 1/16	5 1/32
4 15/16	6 3/32	5 1/16	5 1/32
5	7 1/16	5 1/32	5 1/32
5 1/16	7 3/32	5 3/32	5 3/32
5 1/8	7 1/4	5 3/32	5 3/32
5 3/16	7 3/32	5 3/32	5 3/32
5 1/4	7 3/32	6 1/16	5 1/16
5 5/16	7 3/32	6 1/16	5 3/4
5 3/8	7 3/32	6 1/32	5 1/16
5 7/16	7 1/16	6 1/32	5 3/16
5 1/2	7 3/32	6 1/32	5 3/16
5 9/16	7 3/32	6 3/32	6 1/16
5 5/8	7 3/32	6 1/16	6 1/16
5 11/16	8 1/16	6 1/16	6 1/16
5 3/4	8 1/8	6 1/32	6 1/16
5 13/16	8 3/32	6 3/32	6 1/16
5 7/8	8 1/16	6 1/16	6 1/16
5 15/16	8 3/32	6 1/16	6 1/16
6	8 1/16	6 1/32	6 1/16

DETERMINING THE LENGTH OF SIDES OF POLYGONS

Tables presented in the preceding Data Sheet give the correct diameters for circles circumscribing squares, hexagons and octagons of various sizes ranging from 1-16 to 6 inches across flats. In order to lay out these polygons on a pattern with a pair of dividers it is necessary also to know the length of one side of the polygon. These data are given in the accompanying tables.

Distance across flats, inches	Length for squares, inches	Length for hexagons, inches	Length for octagons, inches
1/16	1/16	3/32	3/32
1/8	1/8	6/64	5/64
3/16	3/16	9/64	8/64
1/4	1/4	12/64	10/64
5/16	5/16	15/64	1/8
3/8	3/8	3/16	3/16
7/16	7/16	1/4	7/32
1/2	1/2	24/64	20/64
9/16	9/16	27/64	23/64
5/8	5/8	30/64	25/64
11/16	11/16	33/64	14/64
3/4	3/4	9/16	15/64
13/16	13/16	39/64	16/64
7/8	7/8	1/2	17/64
15/16	15/16	45/64	19/64
1	1	27/32	11/32
1 1/16	1 1/16	49/64	21/64
1 1/8	1 1/8	27/32	11/32
1 3/16	1 3/16	53/64	11/32
1 1/4	1 1/4	57/64	12/32
1 5/16	1 5/16	59/64	25/64
1 3/8	1 3/8	31/32	13/32
1 7/16	1 7/16	1 1/64	27/64
1 1/2	1 1/2	1 3/64	7/16
1 9/16	1 9/16	1 7/64	29/64
1 5/8	1 5/8	1 5/32	15/32
1 11/16	1 11/16	1 9/64	31/64
1 3/4	1 3/4	1 13/64	33/64
1 13/16	1 13/16	1 15/64	17/32
1 7/8	1 7/8	1 17/64	35/64
1 15/16	1 15/16	1 9/32	9/16
2	2	1 5/16	37/64
2 1/16	2 1/16	1 21/64	39/64
2 1/8	2 1/8	1 11/32	5/8
2 3/16	2 3/16	1 23/64	41/64
2 1/4	2 1/4	1 25/64	21/32
2 5/16	2 5/16	1 27/64	43/64
2 3/8	2 3/8	1 3/8	11/16
2 7/16	2 7/16	1 29/64	45/64
2 1/2	2 1/2	1 15/32	23/32

Distance across flats, inches	Length for squares, inches	Length for hexagons, inches	Length for octagons, inches
2 9/16	2 9/16	1 31/64	1 1/8
2 5/8	2 5/8	1 33/64	1 3/32
2 11/16	2 11/16	1 35/64	1 7/64
2 3/4	2 3/4	1 1/2	1 1/64
2 13/16	2 13/16	1 5/8	1 11/64
2 7/8	2 7/8	1 31/32	1 3/16
2 15/16	2 15/16	1 43/64	1 17/64
3	3	1 47/64	1 19/64
3 1/16	3 1/16	1 49/64	1 49/64
3 1/8	3 1/8	1 51/64	1 25/32
3 3/16	3 3/16	1 27/32	1 13/16
3 1/4	3 1/4	1 7/8	1 29/32
3 5/16	3 5/16	1 59/64	1 15/16
3 3/8	3 3/8	1 61/64	1 31/32
3 7/16	3 7/16	1 63/64	2 1/64
3 1/2	3 1/2	2 1/64	1 63/64
3 9/16	3 9/16	2 1/16	1 1/32
3 5/8	3 5/8	2 3/32	1 1/2
3 11/16	3 11/16	2 1/8	1 33/64
3 3/4	3 3/4	2 1/64	1 35/64
3 13/16	3 13/16	2 3/64	1 37/64
3 7/8	3 7/8	2 1/32	1 19/32
3 15/16	3 15/16	2 7/64	1 5/8
4	4	2 1/16	1 41/64
4 1/16	4 1/16	2 11/64	1 43/64
4 1/8	4 1/8	2 3/32	1 45/64
4 3/16	4 3/16	2 13/64	1 47/64
4 1/4	4 1/4	2 7/32	1 23/32

Distance across flats, inches	Length for squares, inches	Length for hexagons, inches	Length for octagons, inches
4 5/16	4 5/16	2 31/64	1 25/32
4 3/8	4 3/8	2 17/32	1 13/16
4 7/16	4 7/16	2 9/16	1 27/32
4 1/2	4 1/2	2 19/32	1 29/32
4 9/16	4 9/16	2 41/64	1 57/64
4 5/8	4 5/8	2 43/64	1 59/64
4 11/16	4 11/16	2 11/16	1 15/16
4 3/4	4 3/4	2 3/4	1 31/32
4 13/16	4 13/16	2 25/32	2
4 7/8	4 7/8	2 13/16	2 1/64
4 15/16	4 15/16	2 27/32	2 3/64
5	5	2 29/32	2 1/16
5 1/16	5 1/16	2 31/32	2 3/32
5 1/8	5 1/8	2 61/64	2 1/8
5 3/16	5 3/16	3	2 3/64
5 1/4	5 1/4	3 1/32	2 1/64
5 5/16	5 5/16	3 1/16	2 13/64
5 3/8	5 3/8	3 3/64	2 7/32
5 7/16	5 7/16	3 1/64	2 1/4
5 1/2	5 1/2	3 1/64	2 9/32
5 9/16	5 9/16	3 7/32	2 17/64
5 5/8	5 5/8	3 1/4	2 21/64
5 11/16	5 11/16	3 5/32	2 11/32
5 3/4	5 3/4	3 5/16	2 3/8
5 13/16	5 13/16	3 23/32	2 13/32
5 7/8	5 7/8	3 7/8	2 7/16
5 15/16	5 15/16	3 27/32	2 29/64
6	6	3 15/16	2 31/64

UNITED STATES RUBBER COMPANY

SERVING THROUGH SCIENCE

35 Years Ago

THIS FOUNDRY FOUND THE ANSWER

How to maintain production while keeping grinding costs down? Today that's a big worry—but even back in 1912 a well-known malleable iron foundry was faced with the same problem, and the management found the answer because they knew where to look for it.

They knew that wheels made by "U.S." were originated in 1863.

They knew that "U. S." had research facilities which not only thoroughly covered abrasives and bonds, but also extended into all the fields covered by the many products of United States Rubber Company.

And they knew that "U. S." would come up with the type of wheel that would meet requirements.

This foundry picked U. S. Wheels and has been using them ever since.

Whether you're snagging castings or grinding ball races, there's a U. S. Royalite Wheel engineered precisely to the job—carefully tested in both factory and laboratory.

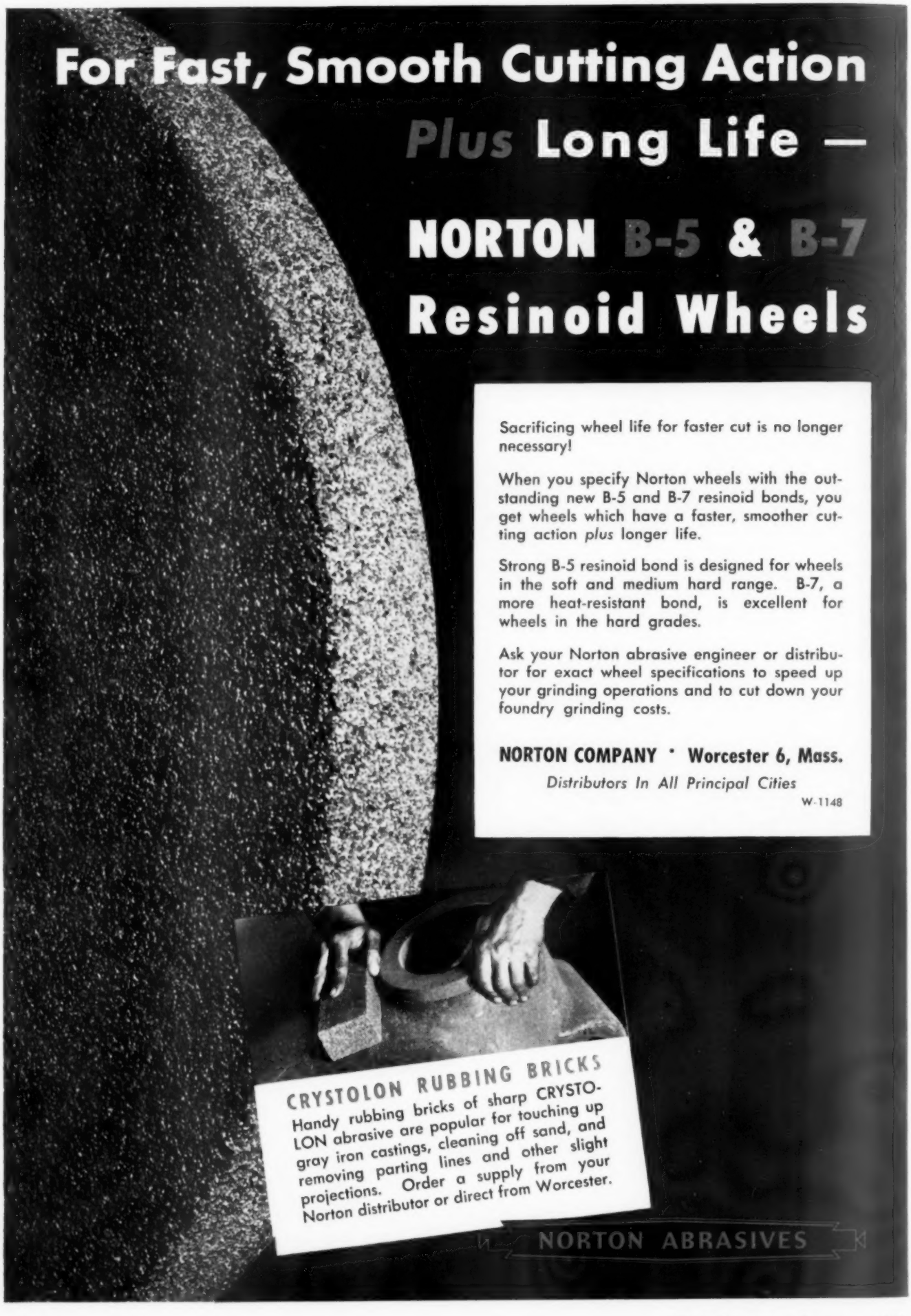
For your own particular needs, you can obtain *in advance* accurate grinding costs with U. S. Royalite Wheels from one of our trained field engineers, who will make thorough tests right in your own plant.

Write to Mechanical Goods Division, United States Rubber Company, 1230 Avenue of the Americas, New York 20, N. Y.

U. S. ROYALITE GRINDING WHEELS

Engineered to your job

For Fast, Smooth Cutting Action *Plus* Long Life — NORTON B-5 & B-7 Resinoid Wheels



Sacrificing wheel life for faster cut is no longer necessary!

When you specify Norton wheels with the outstanding new B-5 and B-7 resinoid bonds, you get wheels which have a faster, smoother cutting action *plus* longer life.

Strong B-5 resinoid bond is designed for wheels in the soft and medium hard range. B-7, a more heat-resistant bond, is excellent for wheels in the hard grades.

Ask your Norton abrasive engineer or distributor for exact wheel specifications to speed up your grinding operations and to cut down your foundry grinding costs.

NORTON COMPANY · Worcester 6, Mass.

Distributors In All Principal Cities

W-1148

CRYSTOLON RUBBING BRICKS

Handy rubbing bricks of sharp CRYSTOLON abrasive are popular for touching up gray iron castings, cleaning off sand, and removing parting lines and other slight projections. Order a supply from your Norton distributor or direct from Worcester.

NORTON ABRASIVES

ELECTRIC FURNACE STEEL CONFERENCE

(*Concluded from page* 116)

and a new slag highly oxidizing conditions were developed. Then small successive additions of ferroalloys were made to the slag to provide reducing conditions, at the same time allowing the temperature to drop. That method, according to the author, gives sufficient time for the various elements to react and the inclusions to float to the slag-metal interface and be removed.

Friday afternoon session on acid electric furnace practice was under the direction of Alden Safford, Chapman Valve Mfg. Co., Indian Orchard, Mass., and C. H. Cousineau, West Michigan Steel Foundry Co., Muskegon, Mich. Subject was "Factors Controlling Slag Weight" and consisted of the presentation of 12 papers on various phases. Consensus was that the factors investigated by the various authors had little effect on the weight of slag produced. Papers and the authors were: "Review of Known Factors" by Charles E. Locke, West Michigan Steel Castings Co., Muskegon, Mich.; "Effect of Bottom Shape and Life on Slag Weight" by James A. Bowers, American Cast Iron Pipe Co., Birmingham; "Effect of the Extent of Bottom Repairs on Slag Weight" by J. D. Cannon, Grede Foundries Inc., Milwaukee; "Effect of the Extent of Bank Repairs on Slag Weight" by F. B. Eiseman, Ross-Meehan Foundries, Chattanooga, Tenn.; "Effect of Cleaned vs Uncleaned Foundry Scrap on Slag Weight" by W. L. Doyle, Fort Pitt Steel Casting Division, Pittsburgh Steel Foundry Corp., McKeesport, Pa.

"Effect of Metal Depth on Slag Weight" by M. T. McDonough, National Malleable & Steel Castings Co., Sharon, Pa.; "Effect of Taps Used in Producing a Heat on Slag Weight" by D. McDyre, Dodge Steel Co., Philadelphia; "Effect of Temperature in Producing a Heat on Slag Weight" by J. B. Caine, Sawbrook Steel Castings Co., Lockland, O.; "Effect of Iron Ore Additions on Slag Weight" by H. R. Hoffman, Wehr Steel Co., Milwaukee; "Effect of Dolomite Additions on Slag Weight" by G. R. McDaniels, Sawbrook Steel Castings Co., Lockland, O.; "Effect of MnO Additions on Slag Weight" by C. C. Spencer, Electric Steel Castings Co., Indianapolis, and "Effect of Time of Heat on Slag Weight" by Ray H. Frank, Bonney-Floyd Co., Columbus, O.

Closing session on Saturday morning considered "Fundamentals of Electricity for the Melter." Co-chairmen were L. S. Steiner, Timken Roller Bearing Co., Canton, O., and John McBroom, Stainless Foundry & Engineering Co., Milwaukee. Meeting opened with a motion picture entitled "Basic Electricity" which was prepared by Minneapolis-Honeywell Regulator Co. A. R. Oltrogge, General Electric Co., Schenectady, N. Y., spoke on "Meaning of Fundamental Electrical Terms," and F. W. Cramer, Carnegie-Illinois Steel Corp., Pittsburgh, presented a paper on "Operation of the Panel Board."

BRASS AND BRONZE

(*Concluded from page* 81)

pecially as related to the melting and pouring of copper base alloys, has and will have a profound effect on one of the fundamental operations of foundry practice, and will undoubtedly be reflected in greater economies and higher quality.

All told, these two years of "transition" have been healthy, even if strenuous. The year 1948 finds the brass and bronze foundries more ready to do a good workmanlike job in producing castings with a higher degree of overall quality than ever before in the history of the industry.

WALTER W. EDENS, "Brass and Bronze" author, was graduated from Marquette University in 1934 and received his master's degree in metallurgical engineering from University of Wisconsin 3 year later. He joined Heil Co., Milwaukee, in 1936, as an engineer, leaving the following year to join Ampco Metal Inc., Milwaukee, as chief metallurgist and technical director. In 1937 he became associated with Badger Brass & Aluminum Foundry Co., Milwaukee. Mr. Edens is chairman of the Brass and Bronze Division, American Foundrymen's Association.

Sources of Illustrations

Figs. 1, 5—H. B. Salter Mfg. Co., Marysville, O.

Figs. 2, 3—Bethlehem Steel Co., Bethlehem, Pa.

Fig. 4—American Air Filter Co., Louisville.

Research Institute Opened In Texas

Southwest Research Institute, a nonprofit scientific organization designed to aid southwestern industry solve its technological problems, recently opened its laboratories and already has contracted for several projects sponsored by industrial corporations.

It is located on Essar Ranch, 4 miles west of San Antonio, Tex., and was built along lines of Midwest, Armour and Mellon institutes to conduct industrial research on a fee basis.

The first laboratory in a planned series is equipped with modern instruments and machines and houses a complete machine shop with foundry, forge, tin shop, welding and heat treating equipment, chemical and biological laboratories, engineering department, an animal room as part of the biological section, and various cold rooms, sustained humidity rooms, a self-contained power plant, distillation plant and other scientific facilities.

Endowed for more than $1 million by Tom Slick, San Antonio oil man and rancher, Southwest Research Institute is the third and largest unit affiliated with the Foundation of Applied Research, an earlier organization established by Mr. Slick and other trustees.

Southern Machinery Exposition

Third Southern Machinery and Metals Exposition will be held Apr. 5-8 in the Municipal Auditorium, Atlanta, exhibitors including companies from all sections of the country. Ferrous and nonferrous castings will be among products to be exhibited. Michael F. Wiedl Jr., of Michael F. Wiedl & Associates, has been named managing director of the exposition, and reservations for exhibit space should be addressed to him at 267 East Paces Ferry Rd., Atlanta 5. Alva S. Wilson, vice president, Auto-Soler Co., Atlanta, is president of the exposition.

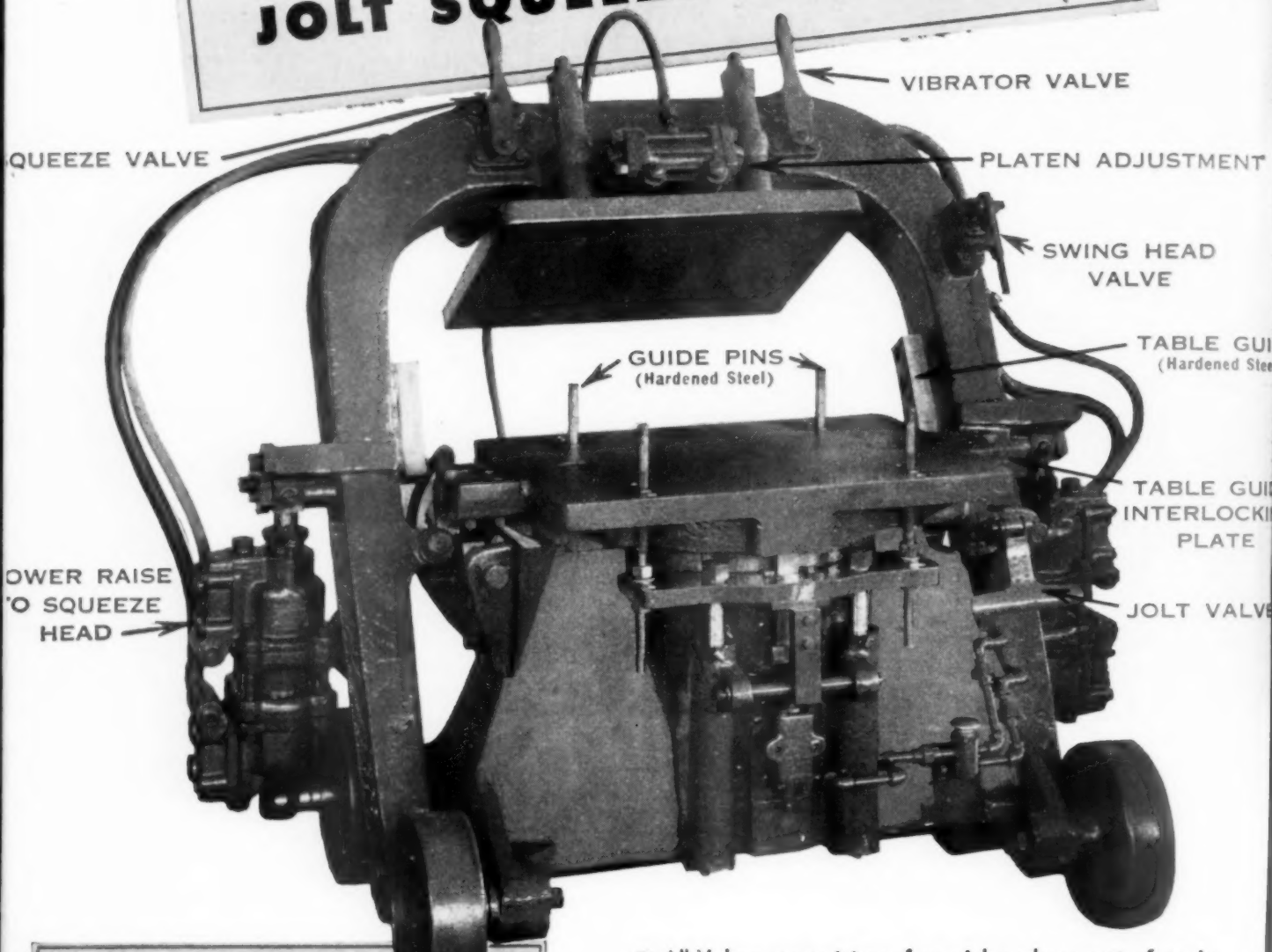
Receives License

Federated Metals Division, American Smelting & Refining Co., has been licensed to manufacture and sell Olympic bronze ingot, a silicon bronze alloy, rights to which are owned by the Chase Brass & Copper Co. The new product, which will be marketed to foundries through Federated's regular sales channels, is designed especially for applications requiring high corrosion resistance and strength and sharp casting detail.

INTERNATIONAL

TYPE JSK-7

JOLT SQUEEZE PIN STRIP



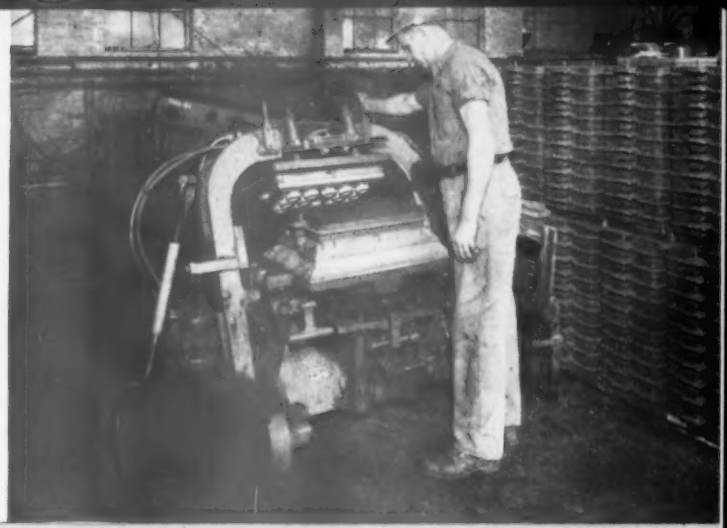
14" Squeeze—5" Jolt
Ramming Height 26"
Outside Length of Flask Overall—32"
Adjustment of Platen 10" to 16" Depth

- All Valves poppet type for quick replacement of parts
- All Guide Pins and Bushings of Hardened Steel
- One Piece Squeeze Head Keeps Alignment
- Automatic Lubrication to Jolt, Squeeze and Push Cylinders
- Jar Table and Squeeze Platen can be made to fit any job
- Portable or Stationary with Rectangular Table

INTERNATIONAL MOLDING

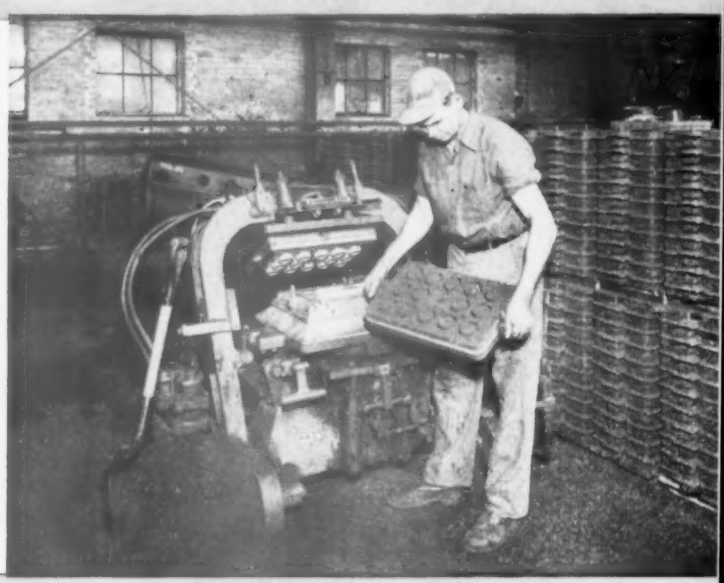
LA GRANGE PARK,

INTERNATIONAL TYPE JSK-7 READY FOR MOLDING



THE MOLD HAS BEEN JOLTED AND STRUCK OFF READY FOR SQUEEZING

THE MOLD HAS BEEN SQUEEZED AND THE FLASK HAS BEEN STRIPPED



THE FINISHED MOLD

The INTERNATIONAL 14" Type JSK-7 Jolt Squeezer has been designed for use in Multiple Molding. A large diameter Squeeze Cylinder plus a solid Jolt gives a very fine ram for both the cope and drag side of the mold.

Two Vibrators are mounted on this machine to facilitate the draw. The Vibrator Valve on the head of the machine acts as a Safety Feature. BOTH hands must be used to actuate the squeeze operation. When the machine is rigged properly, castings can be made to tolerances of thousandths of an inch because of our exclusive feature of control. The table is guided by standard methods and also by specially hardened and ground guide plates added to the table, which enter into hardened and ground guides holding tolerances on these four pieces to .0005 of an inch. This assures an accurate entrance of the drag pattern fastened to the platen into the sand and also guarantees an accurate draw of the drag.

The INTERNATIONAL 14" Type JSK-7 Jolt Squeezer is a heavy duty machine, designed by experienced engineers for fast operation and for long, hard use. Automatically lubricated. Equipped with cleaner valve, Pop Valve and Air Gauge available at slight additional cost.

MACHINE COMPANY

ILLINOIS SUBURB OF CHICAGO

ALUMINUM CASTINGS

(*Continued from page* 73)

apparently has been given to the possibilities for application of these or related techniques in the aluminum foundry. It seems that further study of the subject would be merited especially in connection with aluminum alloy castings because of the relatively greater potential economies in this field than in heavy metal casting production.

Increased application of low-frequency induction furnaces for melting aluminum alloys for casting has occurred during the last two years. In the aluminum casting field, this type of melting equipment has been installed principally in permanent mold and die casting foundries. The new development of pumping molten aluminum alloys by use of forces existing in a submerged resistor induction furnace channel affords intriguing possibilities as a method for transferring molten metal or pouring castings.

Metallurgical Developments — The aluminum-copper-silicon casting alloys are not new but developments in these alloys have imparted a position of much greater importance to them since V-J Day. Need of an outlet for the large quantities of scrap made available as an aftermath of the high volume output of aluminum alloy products during the war years prompted development of new aluminum-silicon-copper alloys. These essentially new aluminum alloys contain about 6 per cent silicon and 3.5 per cent copper as major alloy constituents and relatively large amounts of several impurity elements are allowed. Although scrap consumption was a guiding consideration in development of these alloys, provision of superior casting characteristics was a major factor in selection of composition.

Generally excellent casting characteristics and comparatively high mechanical properties in the as-cast or heat treated conditions are provided by these alloys. Extensive use is being made of them for production of both sand and permanent mold castings. A variation of this composition, with the silicon content raised to about 8.5 per cent, has attained a position of some importance in die casting production.

Current activity in aircraft jet engine design has stimulated study of aluminum alloy compositions that might provide casting alloys with higher mechanical properties at elevated temperatures. Considerable time and money have been expended on investigation of this subject over the last thirty years, and several research organizations have renewed the study since the end of the war. Although there is an almost discouragingly large number of multi-element compositions to be studied, and determination of tensile, fatigue and creep properties at elevated temperatures requires considerable time, yet it is hoped that concerted study of the subject will be productive of the desired results.

Product Development—Product development has been a most interesting phase of progress in the aluminum foundry industry since the close of the war. Limited availability and the higher cost of cast iron parts were responsible for start of production in aluminum alloys of many castings that had always been made of cast iron. Although some of these substitutions undoubtedly were of a temporary nature, production of a number of these parts will constitute new and permanent business for aluminum foundries. A few of these products that are essentially new as aluminum castings merit more detailed comment.

Cast aluminum piano plates (Fig. 2) have received a great deal of publicity in recent months. The history of unsuccessful efforts to establish the suitability of aluminum for piano plates covers a period of a great many years, but adoption of cast aluminum plates for volume production of pianos occurred only within the last two years after the reasons for previous failures had been discovered.

The aluminum plate usually weighs a little less than 40 per cent of the weight of its cast iron counterpart. Selection of a suitable alloy and heat treatment were essential to the success of this development. Application of stress analysis, about which more will be said later, also contributed to the attainment of this weight reduction as well as to development of successful designs for aluminum plates. The problem of design is apparent when consideration is given to the fact that the tuned strings impose an 18-ton load on a spinet piano plate.

Burner heads for domestic gas stoves cast of aluminum alloys were produced as die castings prior to the war. Additional quantities of complete burners have been sand cast of aluminum recently. Although weight saving probably has relatively little value in this application, desirable appearance and relative ease of cleaning and drilling should be advantages of aluminum alloy burners.

Many Applications Developed

Lawn mower parts, valve handles and stool bases for restaurants and bars serve as examples of parts produced in quantity after the war as aluminum alloy castings largely because of the limited availability and increased cost of iron castings. Alteration of these conditions with respect to cast iron could result in a return to use of this material for such parts. Evidence of a trend in this direction already has been observed, but many parts in this category probably will continue to be made as aluminum castings. Superiority of certain aluminum castings due to some characteristics, such as lower finishing costs, performance or better appearance in addition to the weight reduction, will have been demonstrated by actual use of the aluminum part.

A rear axle and differential housing for heavy duty trucks, made of aluminum alloy sand castings (Fig. 1), was introduced by an axle builder as a standard item of equipment about the middle of 1946. Cast aluminum alloy brake shoes and hubs also constitute parts of the assembly. The weight reduction in this unit is of particular significance in automotive design because it is gained in an unsprung member. Announcement of commercial production of the axle climaxed several

(*Concluded on page* 126)

WALTER E. SICHA, author of the article "Aluminum," was graduated from Case Institute of Technology and received a master's degree in metallurgy from University of Michigan. He joined Aluminum Co. of America in 1929 as a technician, later became magnesium foundry superintendent and at present is a research metallurgist in the Cleveland Research Division of the Aluminum Research Laboratories of the company. Mr. Sicha is a member of the American Society for Metals and is on the executive committee of the Aluminum and Magnesium Division of the American Foundrymen's Association.

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IN a recent national survey made by a leading industrial publication, 81.1% of electric industrial truck users expressed a preference for Exide-Ironclad Batteries.

Such overwhelming preference for the Exide-Ironclad Battery is based upon user experience. This unique battery has, during the past 35 years, proved itself to be a thoroughly dependable, safe and efficient power source for all makes and types of electric industrial trucks.

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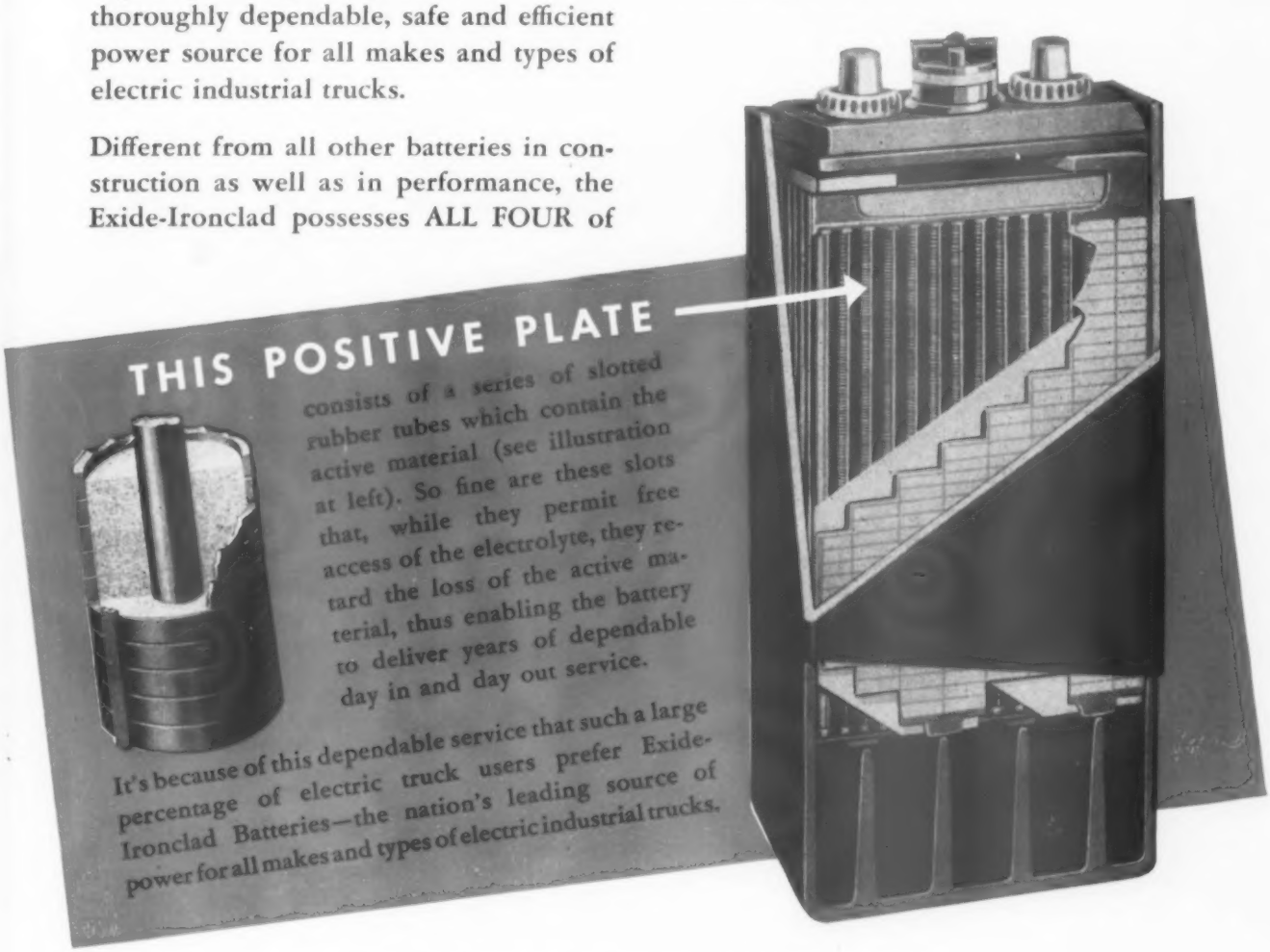

THIS POSITIVE PLATE

consists of a series of slotted rubber tubes which contain the active material (see illustration at left). So fine are these slots that, while they permit free access of the electrolyte, they retard the loss of the active material, thus enabling the battery to deliver years of dependable day in and day out service.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

(*Concluded from page* 124)

years of research on use of aluminum for this purpose, a development program that was interrupted by the war.

Irrigation pipe (Fig. 4) of aluminum is readily portable, which is the principal characteristic responsible for its expanding use by farmers and fruit growers. Frequent shifting of the irrigation pipe is common practice and this operation is simplified by the light weight of the pipe sections. Although the pipe is extruded, cast aluminum alloy fittings and couplings are important components of the irrigation systems. Fittings for other purposes have been cast of aluminum but this application for them is new.

Bearings cast of aluminum alloys were introduced several years ago on a predominantly experimental basis but commercial levels of production were reached comparatively recently. The aluminum alloy employed most commonly for bearings contains about 6.5 per cent tin, 1.0 per cent nickel and 1.0 per cent copper. Solid bearings are machined from permanent mold castings of this alloy. Ability to sustain high service loads and to resist corrosive attack by organic acids formed through oxidation of lubricating oils during use characterize these bearings. High shaft speeds generally are accompanied by high operating temperatures and the combined influence of these factors has been to limit aluminum bearings to use in engines operating in the lower speed range.

Chief commercial application for the solid aluminum alloy bearings has been in diesel engine service where the high fatigue life provided constitutes a major advantage. Limited use of these bearings has been made in aircraft engines and continued experimental work offers promise of developing aluminum bearings for passenger car engines.

Rotors for electric motors (Fig. 6) with aluminum conductors and collector rings cast as a unit with the steel laminations have been produced in increased quantities within the last two years. It is probable that both the higher cost of copper and the lower cost of production methods adapted to the use of aluminum are contributing factors. High electrical conductivity, provided by commercially pure aluminum, is desired in the aluminum portion of rotors for certain types of motors. In other rotors, relatively low conductivity is required in the aluminum alloy conductors.

Various methods have been employed in production of these rotors, including a pseudo permanent mold process in which the molten aluminum is introduced upward at a low pressure through the laminations, the die casting and the centrifugal casting processes. A related application for aluminum alloy castings that has grown lately is in small electric motor bases and end plates. Some of these parts have been die cast and some have been made in permanent molds.

Aluminum alloy galvanic anodes (Fig. 5) are of a simple geometric shape associated with that of ingots or billets and are generally cast in iron molds. Attachment of galvanic anodes by current carrying leads to underground steel pipe lines or tanks provides electrolytic protection of the steel through sacrificial corrosion of the aluminum alloy anode. If this development continues to be successful, a large potential outlet for aluminum may be anticipated because of the theoretically greater ampere-hour output per dollar invested in aluminum compared with the more commonly used zinc and magnesium anodes.

Stress Analysis Aids Design

A consideration of great significance to the whole aluminum casting industry is the increasing application of stress analysis for improvement of casting design. Marked progress has been made in recent years in determination of reliable stress analysis techniques. Intelligent use of stress data, procured by means of such tools as brittle lacquers and electrical strain gages, permits attainment of superior life and output of cast machine components. Of comparable importance to foundrymen is the fact that application of these stress analysis methods frequently affords designs that impart equal or superior serviceability together with simplification of casting problems.

Summary. — Scientific and trade publications have described practically all of the developments mentioned in this article. However, several of the postwar developments related particularly to the production of aluminum alloy castings have been assembled and reviewed here for those interested in this specific field. The people who have contributed to this discussion through their published papers or personal suggestions are too numerous to be named individually but the valuable assistance of each one is gratefully acnowledged.

POWDER-CUTTING as a production tool has made progress in the metalworking industry during recent years in cutting and scarfing stainless steels and other materials. The process consists of introducing a finely divided iron-rich powder into the cutting-oxygen stream. In addition to production operations on stainless steel, the process also is being used on cast iron and materials of very high alloy content. The illustration above shows a typical application for hand-cutting risers in a stainless steel foundry. One large steel foundry is powder-cutting 44-in. thick risers from stainless steel castings on a production basis (Linde Air Products Co. photo)

The Maytag Co., Newton, Iowa, recently celebrated the production of its 5 millionth washing machine. On hand for the celebration were Iowa Governor Robert D. Blue; leaders in business, industrial, civic and labor circles, and company personnel.

A BUYING GUIDE FOR ABRASIVES

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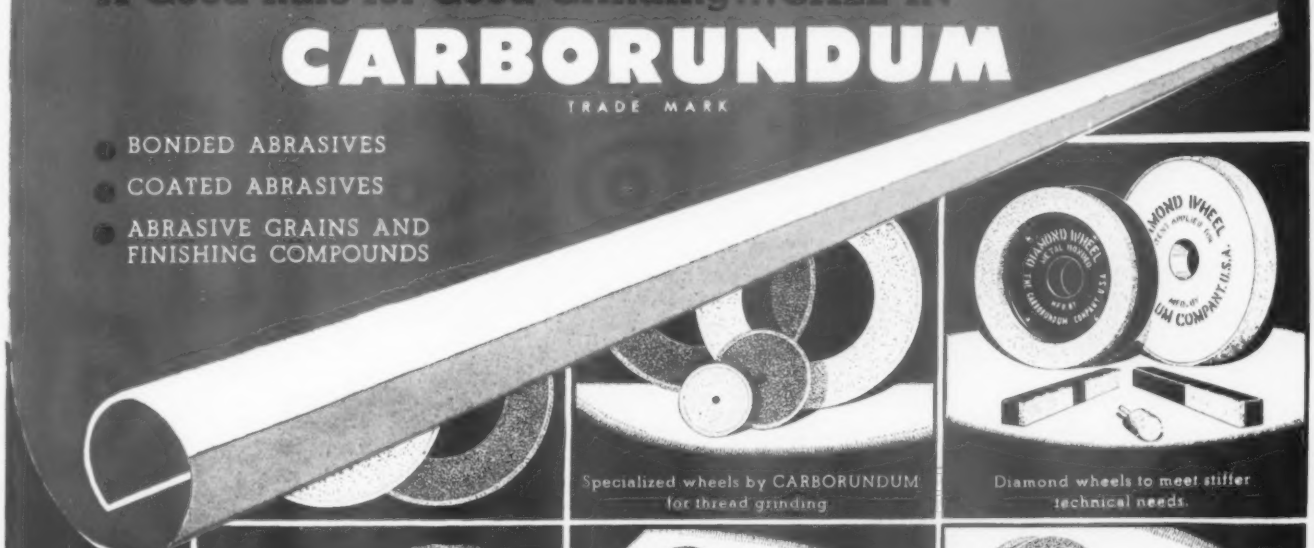

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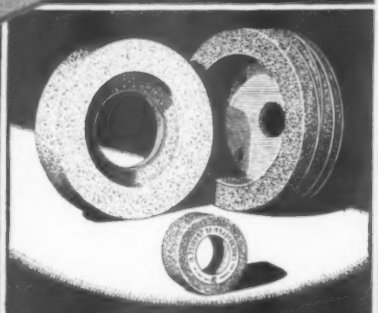
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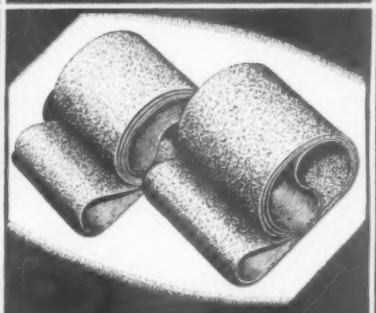
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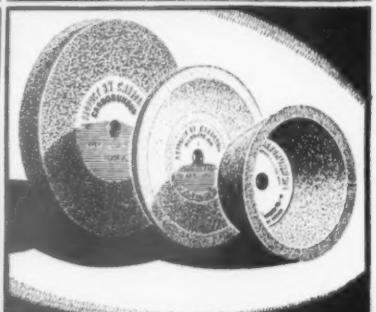
All standard shapes are supplied in grinding wheels by CARBORUNDUM

Foundry Developments

By EDWIN BREMER

INVESTIGATION of oxygen application to cupola melting, although not completed as yet, indicates that increased temperature of the iron, clean tuyeres, and increased melting rate may be obtained with an addition of 8 to 10 per cent O. When the O input is increased to say 15 per cent, difficulty is encountered in that the downward movement of coke and charges in the cupola is not rapid enough to provide uniform melting conditions. Test runs around 10 per cent O show a uniform iron temperature of 2800 to 2850°F with bright tuyeres at all times. Melting rate is increased 15 to 20 per cent, and the refractories stand up reasonably well. Further contemplated work, it is expected, will show the status of O additions to the cupola.

• • •

IN AN EFFORT to encourage standard procedure in pH measurements, the National Bureau of Standards now is supplying four buffer materials in the form of standard samples of certified purity. The substances are acid potassium phthalate, potassium dihydrogen phosphate and disodium hydrogen phosphate (intended to be used together), and borax. Certificates supplied with the compounds specify the pH of certain aqueous solutions of the sample, which can provide fixed points on a pH scale.

• • •

CORRELATION of all studies made in an investigation on the effect of homogenization heat treatment on cast steels as determined through notched-bar impact properties at normal and low temperature, end-quench hardenability, and time-temperature transformation studies led R. J. Marcotte and C. T. Eddy to the conclusion that such treatments are not sufficiently effective in improving the mechanical properties to be employed. Relevant data were presented by the authors in a paper at the recent American Society for Metals annual meeting held in Chicago. Other conclusions were that effect of time of heating at the homogenizing temperature beyond a reasonable minimum period (2 hr) is negligible, and effect of increasing homogenizing temperature above 1650° F is detrimental if a normalizing or normalizing and tempering treatment is used. Detrimental effect results from grain coarsening.

• • •

INTERESTING paper presented at the recent annual meeting of American Society for Metals at Chicago by Carl Zapffe indicates why some metals and alloys are subject to gassiness, pinhole porosity and low ductility. Based on a thermodynamic study of numerous reactions of those materials with moisture in a closed system, Zapffe developed equations and curves showing the high hydrogen potential or pressure resulting for various elements. Data given show that at high temperature iron, carbon, silicon, and aluminum develop high hydrogen potentials while chromium and manganese are considerably lower.

• • •

AN EXTREMELY hard metal which retains its strength and resistance to corrosion at high temperatures has been developed by Kennametal Inc., Latrobe, Pa. It consists essentially of titanium carbide with cobalt as the bonding element, and is formed to desired shape by powder metallurgy processes. It is claimed that the material has been heated to 2100°F for 48 hr without loss of strength, and does not change appreciably when heated to 1800°F and quenched in water. It has a specific gravity about one-third that of tungsten carbide, and two-thirds that of steel.

• • •

ENGINEERS of Westinghouse Electric Corp., East Pittsburgh, Pa., have developed a series of new research-laboratory furnaces. One is capable of producing heats of 3100°F (1700°C) which is nearly 200°F higher than obtained in ordinary laboratory high-temperature furnaces, and has an effective heat zone of 4 cu ft. Furnace is radiant type but, instead of heating elements consisting of fine wire wound on muffles, molybdenum rods laid on ledges in the refractory brick supply the heat. To produce the heating elements, molybdenum to molybdenum welds using atomic hydrogen were made—its first application to large pieces of molybdenum. Another research furnace of the same general principles is expected to produce heats of 3400°F (2200°C), and temperatures of 4700°F (2600°C) are expected in a different but much smaller furnace. In this furnace a tungsten crucible large enough to hold a walnut is heated in an inert atmosphere by a combination of radiant heat and high-frequency induction.

• • •

ACCORDING to a paper by R. J. Meyers, Carnegie-Illinois Steel Corp., and presented at the Open Hearth Division, AIME, meeting in Philadelphia, it was found that substituting graphite for pig iron, and with high-silicon scrap to compensate for the lower silicon content, average time required to make a 20-ton heat of steel was increased by at least one hour. Analysis of recent figures indicated that approximately 7 per cent of metallic charge can be saved by substituting graphite or coke for most of the pig iron in the standard charge. However, that saving does not take into consideration increased time, amount of rejections in the cleaning room, and higher cost of oil and refractories. Weighing objectionable features of graphite and silicon slab substitution against lower cost of that type of charge, resulted in a decision to go back to the standard pig charge.

• • •

ONE STEEL foundry using dolomite as a slag-forming material in the production of acid electric steel found that additions of 6.5 to 18½ per cent increased the amount of slag produced without any other noticeable effect, but when the amount of dolomite was increased to 25 per cent the fun began. The heat became extremely wild, and all the usual practices failed to bring it back to normal conditions. Not until that slag was removed and replaced with a new one, could the heat be brought under control.

• • •

AMOUNT of moisture which can be carried by compressed air is illustrated by the experience of one foundry after the installation of aftercoolers in its compressed air system. Using 6000 cfm it was found that 312 gal of water was separated every 8 hr during the months of August and September—hot and humid months.

LEAST HANDLED . .

IS BEST HANDLED

Molds are finished and closed on Logan Roller Conveyor lines in this modern foundry. After closing, molds are pushed to Roller Conveyor pouring zone, and thence to shakeout, all via conveyor.

MORE PRODUCTION (at no increase in costs) is industry's No. 1 problem today. More foundry production calls for the best in conveyor equipment . . . . to increase volume, to keep cost levels down.

Logan Conveyors have become an actual "part of operations" in the more efficient, modern foundry. Molds, flasks and castings are moved through practically every stage of operations via Logan equipment, thus releasing workers from slow, awkward and expensive hand handling.

Write for literature on Logan equipment, as applied to foundry operations, from molding machines right on through to the final product.

Logan Conveyors

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MAN-TO-MAN
on the Molder's Bench

"Our Molten-Metalcraft"

By RALPH L. LEE

NOT SO long ago I visited a wide-awake up-and-going foundry where they were making a line of finished products of their own. While the bulk of their business was castings for other manufacturers, they had one fairly large-sized department roped off where they were turning out a product they had designed and tooled up for themselves.

The thing that struck me was that, having the whole operation under their thumb, they were able to cut corners all up and down the line. What I mean to say is —they could change a fixture or a tool here or there to wash out a bug in the molding operation. If the iron they were melting needed a little heavier section in one spot, they had no hesitancy in changing the pattern. They could do all of this without any great hullabaloo, committee meetings or running back and forth.

This visit reminded me of a patternmaker back home who was also quite an inventor. He worked out a washing machine the ladies went for in a big way. I understand that from the time he started working on his idea until he was in full swing production he didn't even use the slide rule once. He just made his patterns the way he thought they ought to be (without a print) saw to it that the castings fit together, then rigged up jigs and fixtures to accommodate the castings and other things. Of course, he had a lot of bugs to work out, but he tackled them in his stride and kept pecking away at them till he had them licked.

I have heard that in the old days (when engineers supposedly ran steam engines or locomotives) it was quite common for new products to start in the pattern shop and foundry. This is the reason I'm mentioning the patternmaker-inventor in connection with the foundry I visited. I expect these old craftsmen saw in patterns, sand and molten metal what a potter sees in clay—a basic means for making useful and saleable products, not just another raw material.

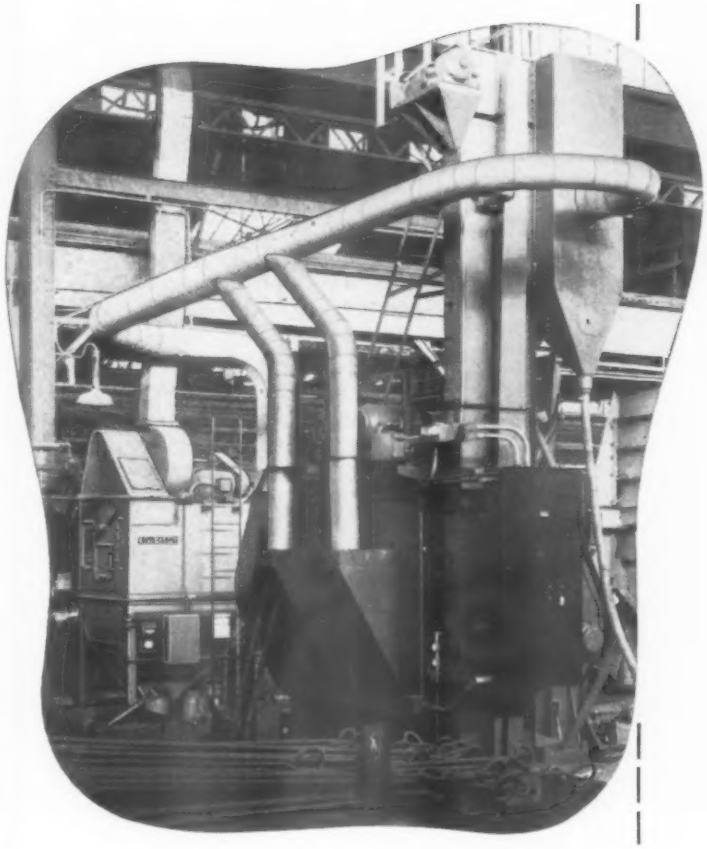
In fact, I remember another washing machine built about that time with a wood tub. The folks who built it were primarily woodworkers manufacturing churns. "The shoe maker to his last," in other words. Anyway, I see foundries all over the country who limit themselves to making castings only from patterns brought into them which in one way puts them into the molding business rather than in the cast products business. Maybe it's all right but I can't get it out of my head as I go through such foundries that we're letting folks who have never learned the trade tell us through the prints and patterns they send us what can and cannot be done with the materials and skills we employ.

Maybe I'm getting in over my head at this point but it just seems to me that there must be all kinds of opportunities for people who are so thoroughly saturated with the possibilities of cast products that they look at everything through foundry-tinted glasses. Such a person would see all kinds of products which should have been made of castings but weren't because the folks who designed them were looking through glasses tinted with stampings, welded steel, drop forgings or some other inappropriate material, to say the least.

Maybe what we've got to do is to turn the pages back a bit and revive the patternmaker and molder inventor, give him a place to tinker in and a chance to show what really can be done with molten metal. I'll bet there are a lot of marketable things just waiting to be invented. Anyway, it seems to me that even the smallest foundries should have a little product development section. Every other line seems to have found such a move necessary and profitable. I believe it would pay off for us; in any event, it would be a lot of good clean fun for those who try.

ROTO-CLONE

removes dust and returns a dividend



THE heavy dust loads created by modern abrasive cleaning offer two problems. One, continued efficiency of the cleaning operation depends upon effective removal of the dust. Two, failure to properly control this by-product results in undesirable working conditions.

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AAF
ROTO-CLONE
DUST CONTROL EQUIPMENT

GRAY IRON CASTINGS

(*Continued from page* 89)

dled with individually manned ladles pouring into molds on conveyors or pouring floors.

Insulated ladles have helped considerably to reduce heat losses. Foundrymen have learned to melt hotter, partly through the pressure for increased production. More rapid metal transfer has also been developed in the interest of increased production as well as in foundries producing large quantities of castings. These operations, speeded up of necessity, have led in many cases to improved castings on the shipping floor.

Improved gating and risering, brought about through the work of the Steel Founders' Society and the Naval Research Laboratory, has added to casting quality and reduced the scrap occurring during the pouring operation. Winte's work on gating through the riser and the use of exothermic compounds for hot topping the risers that are feeding castings, have similarly improved the percentage of saleable castings. The use of exothermic compounds in cores under riser necks points to a means for holding risers open at the bottleneck where for operating reasons a small neck is desirable. Insulating sleeves on risers and insulating pads on mold surfaces, as proposed by Taylor, are intended to provide directional cooling by conserving heat in a manner that is just the reverse of the more common practice of abstracting heat locally by means of chills.

Cleaning and Finishing—Like the black gang in the ship's stoker hold, the cleaning room frequently remains a black hole in many a foundry. Considerable progress has been made in improving shakeout equipment, both permanently installed types and portable types. The disposal of fumes has led to the installation of cooling tunnels and localized ventilating systems which greatly improve working conditions. Many shops are equipped with cleaning rooms ventilated well enough to provide a gentle zephyr into the exhaust vents.

The casting cleaning problem has received the study of the Steel Founders' Society, which reported constructively upon equipment, practice and personnel problems associated with the chipping of castings. A similar study would be useful in connection with the grinding of gray iron castings. Anderson developed a chart for the National Founders' Association which endeavors to average the grinding time for castings and, incidentally, shows that small castings may consume more time in grinding than in molding. An abstract is shown in Table II.

Table II—Castings Ground per Man

Wt of Casting	Wt per Hour
½ lb	225 lb
4 lb	300 lb
10 lb	1800 lb
30 lb	1200 lb

Usually the flow of rough castings into the cleaning room is smooth and steady. Cleaning rooms and cabinets fitted with conveyor systems that index spin and provide for the sand blast or shot spray upon casting within them, represent a high degree of improvement in the cleaning operation, particularly in the production or semiproduction foundry. Other cleaning rooms handling small castings look like Fibber McGee's closet stacked with rough castings, poorly ventilated and filled with noise and confusion. Large casting shops sometimes pile up along the floor a stack of shakeout castings that only a mountain goat could negotiate successfully.

Cleaning rooms with removable roofs and sides represent something of an innovation where large castings are handled. Similarly, grinding stations of the booth type or chamber type offer considerable improvement in working conditions. A great deal of improvement in detail is possible beyond the ventilating, lighting and general housekeeping problems. Studies may be needed back at the pattern shop to design gates, risers and attachments to the castings in a manner that facilitates their removal. In many cases it would pay to study completely mechanical means for removing gates and risers as well as apply similar methods for contour grinding and surface finishing. These operations, aided by jigs and fixtures to guide the mechanisms, would make the grinding operation resemble a machine shop more than a blacksmith's shop.

There are also opportunities for using torch or arc cutting methods to remove undesirable projections from castings, and developing practices which make this procedure economical as well as physically unobjectionable. The handling of castings through the cleaning operations invites consideration of the electromagnet lifts for picking up and carrying them around, while the magnetic chuck holds them in position during grinding. Rubber or plastic jigs and fixtures to hold and position castings on benches invite some thought both in facilitating operations and deadening noises, improving working conditions.

Welding and Repair—The refinishing of castings by welding has emerged as an acceptable and econnomical means for salvaging the occasional wayward casting. The outstanding contribution to the cause is the American Foundrymen's Association, American Welding Society, Society of Automotive Engineers' committee report on recommended practice for "Repair of Defective Automotive Castings." The procedure could very well be extended to provide for all types of castings when grouped into commercially similar classes.

Some progress in the repair-welding of gray iron castings with special nickel-alloy rods, thus providing for machinable welds was described by Kihlgren before the American Foundrymen's Association. A few baby steps toward welding castings into assemblies have been described by other authors, and the practice has prospects for further developments.

The application of resinous sealants to nonferrous pressure castings may develop into an acceptable means for salvaging occasional gray iron castings which possess ample strength but weep and sweat in the pressure test. Expensive castings of intricate design can be salvaged by these means, with ultimate economies for both producer and consumer.

(*Continued on page* 134)

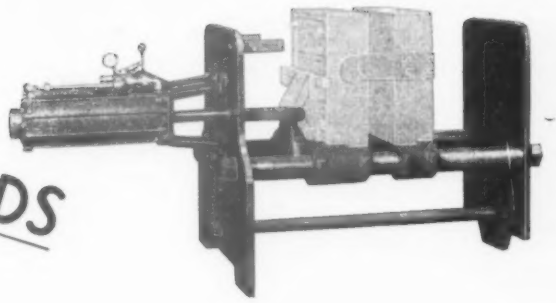
JAMES S. VANICK, author of the article on "Gray Iron," was born in Cleveland, and received bachelor's and master's degrees in science from Case Institute of Technology and George Washington University, respectively. In 1916 he was engineer of tests in New York and Chicago for the British Ministry of Munitions and held the same position from 1917-19 with the U. S. Army, Washington, when he was appointed research metallurgist for the Bureau of Standards. In 1922 he joined International Nickel Co., New York, where he is now a metallurgist with its Development and Research Division.

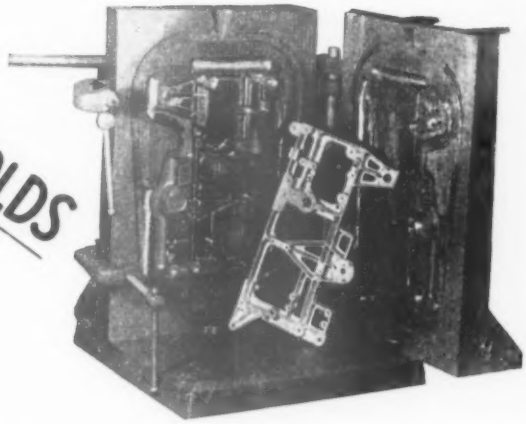
PNEUMATIC PERMANENT MOLDS

MANUALLY OPERATED PERMANENT MOLDS

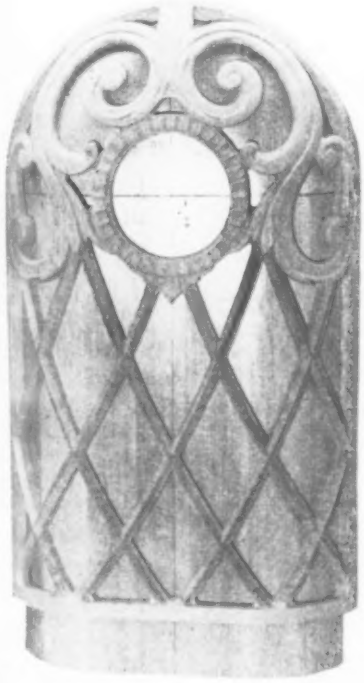
WOOD AND METAL PATTERNS

ALL TYPES OF MODELS





This method of making aluminum castings is rapidly becoming more popular because it is based on three sound economic reasons. Aluminum castings produced in permanent molds are cleaner and better looking; they have a closer dimensional accuracy; they can be produced more economically.



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Your molds and pattern equipment, if properly constructed for the purpose they are to be used, can save you up to 25% on casting cost. On high production items this can amount to even greater savings.

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DESIGNERS AND MANUFACTURERS OF PERMANENT MOLDS, WOOD AND METAL PATTERNS AND MODELS

(*Continued from page* 132)

Material—*Pig Iron*: In a paper before the Gray Iron Founders' Society, Stephenson outlined the prevailing position of pig iron supplies and immediate future prospects. Based on the decade of 1920-1930 when 6 to 6½ million tons of foundry pig went into cast iron production, the output dropped to one-half of this in the 1930-1940 decade. Since 1945 it resumed its 1920-1930 decade rate. Assuming that casting production for 1948 will be stabilized, Stephenson estimated that requirements will be met within 5 per cent. He indicated that the output of a single blast furnace would make up the shortage. The study has been carefully made and presumably it assumes that the foundryman will obtain his remaining requirements from other sources such as scrap. Unless additional scrap is made available the outlook would seem to require three additional blast furnaces. Stephenson wisely points out that the scrap shortage may prolong and accentuate the present shortage of merchant pig iron.

During the 1920-1930 decade, foundrymen learned to utilize scrap effectively, and the availability of scrap made this procedure attractive. The present scarcity of scrap throws a heavier burden on primary metal sources, so that where 6½ million tons of pig were adequate in the 1920-1930 decade to produce approximately 13 million tons of castings, the predicted 5½ million tons of pig for 1947 and 1948, with scrap unavailable or scarcer than normal, leaves the available supply of metallics some 10 and possibly 15 per cent short of current production needs. If the combined shortage of pig and scrap reaches the values indicated, it would seem to be highly desirable for the producers of pig iron and the consumer groups to get together and agree upon a voluntary rationing system. Else in the absence of controls, prices for scrap and possibly pig are likely to go out of bounds.

On the technical side, pig iron production has been increased by the pressurized blast furnace. Making a pressure cooker out of a blast furnace enables it to deliver 10 to 20 per cent greater output. Since this development is a comparatively new one, some time is needed for its perfection and for the installation of more powerful compressors. The contribution to extra production from this source may not be fast enough to meet immediate needs. In other directions, the principal technical progress with foundry pig iron has centered upon its specification by a code which has been developed jointly between the American Society for Testing Materials and consumer-producer representatives. This monumental piece of work has taken considerable time in its construction and may soon be available for coding pig iron purchases and specifications. In the face of a shortage of pig iron, the code may need to stand by until producers and consumers alike can study their requirements and use specifications constructively.

Improved Efficiency Still Beckoning

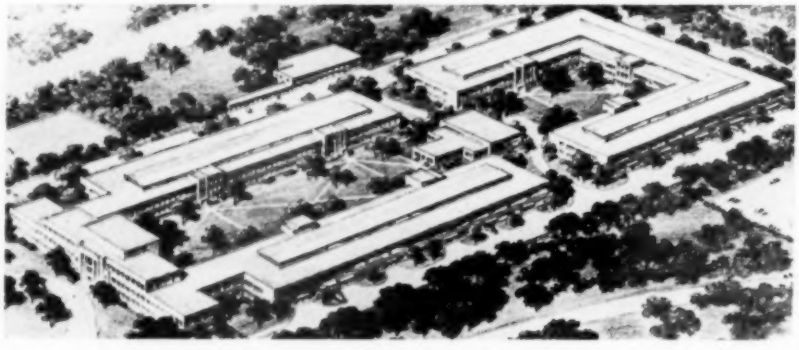
It would seem unbelievable, if it were not confirmed by the record, that pig iron moved downwards from a peak price of $41 in 1920 through a steady decline to $17.50 in 1929. During these years, casting production increased to the 1929 peak. Obviously, the efficiency of operations affecting this blast furnace product had much to do with its reduction in cost. The outlook for improved efficiency is still beckoning, but the quality of raw materials appears to be depreciating so that one can only hope that the history of the 1920-1930 decade might somehow repeat itself.

Scrap: Long-term statistics indicate that an equal amount of scrap and pig iron is consumed in the gray iron foundry. As pointed out previously, a 13-million-ton output would require about 6½ million tons of pig and 6½ million tons of scrap. Barringer reported in a paper before the Gray Iron Founders' Society that the record scrap consumption in the foundry occurred in 1941 with a 5 million ton take. This quantity was used to produce approximately 10 million tons of castings, so that with a 30 per cent increase in casting production, 15 per cent more scrap would be needed to meet current needs. The statistics are confusing on account of the uncertain course of scrap from source to destination, but Barringer estimated that the prevailing 2 million ton monthly collection would maintain the prevailing rate of operation in both steel mill and foundry.

The overall picture of scrap and pig availability from the foregoing statistics does not appear to be adequate to maintain full production. The rising cost of scrap, as shown in Fig. 4, may divert more from the steel mill to the iron foundry, and the shortage of metallics based on prevailing operations may require a scrap diversion of 10 to 15 per cent for the anticipated 13 million ton casting year

(*Continued on page* 136)

New Research Center Is Started



JOHNS - MANVILLE CORP., New York, on Oct. 16 unveiled the first laboratory and pilot plant building of the modern research center it is erecting near Manville, N. J., and laid the cornerstone of the second building.

Located on a 93-acre tract about 40 miles from New York, the new research center will ultimately be composed of five or six buildings, connected by underground subways for trucking and grouped around a quadrangle the size of two football fields. An architect's conception of the entire center is shown above.

The first building, which houses all research and development involving wet processes, is in operation and contains ten miniature factories, or pilot plants, each connected with its own special laboratory—an arrangement that permits research projects to be carried through the laboratory stage to experimental production under one roof.

During the ceremonies, Oct. 16, samples of new products developed in the company's research laboratories were placed in the cornerstone for the benefit of industrial historians of the future. Earl R. Williams is director of the new research center.

Highest Quality Steels
MADE WITH VANCORAM FERRO VANADIUM

The high quality of Vancoram Ferro Vanadium, consistent from lot to lot, assures the steelmaker closer control during production and a finished product of unexcelled microstructure and physical properties. The alloy is produced in the following grades to meet the requirements of various products and manufacturing technics:

	Typical Composition
GRADE "A" *(Open Hearth)*	Vanadium . . . 35-40% Silicon . . . . max. 12% Carbon . . max. 3.50%
GRADE "B" *(Crucible)*	Vanadium . . . 35-45% Silicon . . . max. 3.50% Carbon . . max. 0.50%
GRADE "C" *(Primos)*	Vanadium . . . 35-45% Silicon . . . max. 1.25% Carbon . . max. 0.20%
HIGH V GRADES	Vanadium . . . 50-55% 60-65% 70-80% Silicon . . . . . Low Carbon . . . . . Low

Large stocks are carried of all grades of alloys, and they can be supplied in any of the standard lump, crushed, or mesh sizes.

Our metallurgists will be glad to assist you in the application of Vancoram Ferro Vanadium to meet your specific requirements.

MAKERS OF FERRO ALLOYS VANCORAM *CHEMICALS AND METALS*

VANADIUM CORPORATION OF AMERICA

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • DETROIT • CHICAGO • CLEVELAND • PITTSBURGH

(*Continued from page* 134)

of 1948. Barringer indicated that the predictions were based upon current practices and excluded the intervention of any disturbing factors. The reservoir of automotive, agricultural and machinery scrap had not begun to fill. A million junked autos in scrap yards all over the land were being cannibalized to keep obsolete cars in motion. Several million more refugees from the scrap pile were riding the roads awaiting replacement.

Until replacement balances delivery, scrap supplies will continue to be short of demand. The only potential new source for scrap rested in the scrapping of Naval and Maritime shipping which constituted one of the prevailing reserves. As mentioned before, self-imposed rationing may become necessary along with wartime scrap conservation drives made on a voluntary peacetime basis in the effort to prevent high prices and to direct salvageable scrap to sources in which it can be effectively used.

Coke: Prospects for an adequate supply of fuel to melt a tonnage equal to the 1947 output, look good, barring "strikes, fires and other disturbances" which are frequently listed in the notes on most foundrymen's billings or quotations. Fuel needs have been relieved slightly by recent developments in the use of anthracite coal. Anthracite up to 35 per cent of the coke split has been recommended for use in those geographical areas where anthracite is freely available. A large-sized coal is preferred, equal in size to the coke now used. A recommended procedure is to use a 25-35 per cent quota in the fuel split between the last ten charges used to fill the cupola, and to continue the diet for succeeding charges if the allotted anthracite increment is satisfactory.

Beehive Coke Relieves Shortage

Beehive coke similarly helps to take the edge off of the fuel shortage in those areas in which it is economically available. The recent purchase of a domestic gas manufacturing plant by a large producer and consumer of automotive castings suggests additional means by which foundrymen might make available coal coking facilities for the production of industrial fuel if their needs become sufficiently acute to require encroachment upon the supply of domestic fuel. This procedure requires access to coal that is suitable for processing into foundry coke.

There is still much recrimination in the trade concerning the quality and uniformity of foundry coke and other fuels. Krause and Lownie made an excellent survey of existing data on foundry coke and arrived at some suggestions for defining the product. At present, any specifications that exist occur solely between individual foundrymen and their producers, or merely occur as unwritten agreements. Coke producers have indicated a willingness to meet the foundryman's needs if he can define them. Eventually specifications will be developed. Since there are no established specifications for foundry coke, the situation leaves other fuels such as anthracite coal or beehive coke free of definition. The shortage of fuel has accentuated the need for conservation, and a number of technical papers have re-emphasized the importance of this feature in the period since 1945.

Metallurgy and Research—In the field of casting design and production, progress, as previously mentioned, has been made along the line of applying the principles of directional solidification. The use of exothermic cores, insulating pads and sleeves sometimes helps. At the Naval Research Laboratory, Schaum has demonstrated that convection currents in solidifying metal have a tendency to circulate upwards, thus simplifying an understanding of the desirability for employing risers that increase progressively in diameter from bottom to top to maintain the hot top principle and do their feeding job.

In the program to improve casting quality, Linabury published a report on rejections of castings purchased from various sources, concluding, quite naturally, that low rejections were associated with production units that practiced close control. In the program to improve casting quality, the American Foundrymen's Association is about to publish a compilation of typical casting defects which offer a guide to the operator as to the origin of the defect. The Institute of British Foundrymen has already published its "Atlas of Defects in Castings."

A French research by Delbart and Potaszkin on high-strength cast irons confirmed prevailing American practice of employing nickel-molybdenum additions and inoculants to develop tensile strengths in the 60,000-psi range. An average composition of 2.80 per cent carbon, 1.80 per cent silicon and 0.70 per cent manganese, with 1.60 per cent nickel and 0.60 per cent molybdenum was used. Inoculation with calcium-silicide indicated that approximately 0.25 per cent silicon added in this manner produced optimum results. The desirability of inoculating was emphasized. Casting temperatures were not positively identified as critical factors except that at low temperatures porosity increased.

In the United States, developments along the lines of tensile strength resulted in values close to 100,000 psi for piston ring castings and 70,000 psi for heavy sections such as crankshafts. Eagan received, quite deservedly, an honorable mention in the *"Materials & Methods* 1947 Achievement Award" for his work on the development of the cast iron crankshaft. Achievements with castings are arousing engineering interest. Several additional achievements are coming up over the horizon. Heavy 50-ton castings in the 60,000 psi tensile class for paper mill drier rolls have also been mentioned.

Other recent developments are: The manufacture of low-expansion cast irons for machine tool parts; the increasing uses for cast iron in the railroad industry for journal boxes; cylinders and pressure castings for elevated temperature service; heat-resisting applications for grates, grids, catalyst oil-cracking units, stoves, steel mill soaking pit covers; renewed activity in the economical production of sinks, bathtubs, enamelware, etc.; new developments in the mass production of soil pipe and centrifugally cast pressure pipe; permanent mold cast, corrosion resistant bolts; progress with abrasion-resisting martensitic alloy cast iron for the cement, clay working and ceramic industries; a rapidly expanding use of Ni-Hard for ball-mill liners, scoops, classifier blades, pipe and pumps, in the mining industry. These typical applications are all in commercial production.

Experiment With Hot Rolled Iron

Experimentally, Piwowarsky has reported on cast iron that has been hot rolled, and claims tensile values for it in the 85,000-140,000 psi range along with 1 to 6 per cent elongation. The product is proposed for bearings and bushings as well as for piston rings because of its low notch sensitivity. Another experimental product is a steel-reinforced cast iron in which up to 10 per cent of the solid casting volume consists of reinforcing steel bars which are expected to fuse and blend with the proposed base metal to form a product up to 30 per cent stronger than the cast iron itself. From the British Cast Iron Research Association labo-

(*Continued on page* 138)

TWO MEXICAN GRAPHITE PRODUCTS THAT WILL INCREASE PROFITS AND QUALITY IN YOUR FOUNDRY

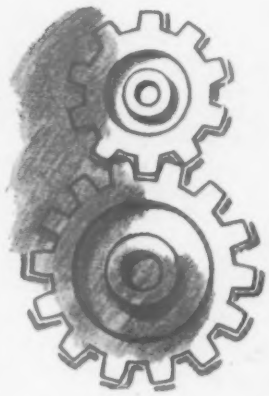
MEXITE BRIQUETTES

SAVE PIG IRON COSTS

Weighing only 4 lbs. each and yielding as much graphitic carbon as 50 lbs. of pig iron, Mexite Briquettes help reduce melting costs by allowing the use of more cheap scrap. Mexite is put in with the steel in high steel charges, and in coke splits when using 100% scrap. Twenty Mexite Briquettes thrown in below the tuyeres when making up the coke bed and four introduced with each ton of metal charged will hold the carbon closer to specifications and act to replace 200 lbs. of pig iron per ton of charge with normal operation.

NO. 8 MEXICAN GRAPHITE

SAVES MACHINING COSTS



If you are pouring light sections and want good machineability, low hardness, and no chilled edges, add 2 lbs. of No. 8 Mexican Graphite to each ton of metal, or less, by trickling at the spout or tossing into the ladle while filling. At a cost of less than 10c per ton, No. 8 Mexican Graphite eliminates the need for annealing and reduces cleaning room and machine shop expense. Write for full information and metallurgical assistance in increasing profitable production in your foundry with Mexite Briquettes and No. 8 Mexican Graphite.

THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

(*Continued from page* 136)

ratories, reports have been issued concerning methods for controlling the shape and distribution of graphite particles, leading to the production of a high-strength iron. Some references to the relation of sulphur to graphite structure have been reported by Morrough, and in the United States, Schaum and his associates described microradiographs intended to portray three-dimensional graphite in the structure.

Some further study has been given to the relationship between weather and chill depth, by Wisbrun. It is generally known that a high humidity introduces hydrogen and oxidizes silicon, manganese and carbon, with a consequent tendency to deepen the chill. The effects of minute quantities of nonferrous contaminants introduced during the alloying of cast iron have been studied by Battelle and found harmless except in the case of zinc, lead, bismuth, and tellurium if present in excessive amounts. Further progress has been made in an appreciation of the value of inoculants for controlling the structure, properties and machinability of cast iron, and a wider use of inoculants in the industry has occurred.

Much Data Gathered

Other metallurgical topics which have received some attention recently are the section-vs-size relationships described by Winte and also by Geist and Hambley, leading to proposed specifications for castings of heavy section. The accumulative data resulting from the survey of cast iron at elevated temperatures was published about 1945, and this led to a tentative specification for the application of cast iron at elevated temperatures which has been published in the *Standards* of the ASTM. MacKenzie completed a statistical study of the relationship between hardness and strength for a wide range of cast irons, leading to charts that endeavor to illustrate the relationship between hardness and strength.

In Great Britain, the Institute of British Foundrymen has evolved a standard impact test based on the principles of the Izod impact test using a machined surface specimen of approximately arbitration bar dimensions. Some stress-resistance gage tests have been reported on car wheel castings by Flinn which indicate a useful method for mapping the position and magnitude of stresses in commercial castings. A survey of this procedure has been sponsored by the ASTM.

Marketing — There is little likelihood from the charts shown in the early text that casting costs will come down soon. Indications are that price stabilization has not yet been achieved. Lower prices, if they occur at all, must come about through a greater output or efficiency per man. This was discussed at an October, 1947, meeting of the National Association of Manufacturers at Virginia Beach by Neil Moore, president of the Sealed Power Corp., who remarked: "Since increased productivity is needed to improve individual living standards, properly drawn incentive plans are of greater importance now than ever before." As an aid to greater efficiency, limited and special mechanization will be needed, better working conditions including ventilation, less handling of the material and work, and more efficient use of sand and fuel.

JAMES H. LANSING, author of the malleable iron castings article, following graduation from Williams College spent a number of years in operating and supervisory capacities with various malleable foundries, including Eastern Malleable Iron Co, Troy, N. Y., Lakeside Malleable Castings Co., Racine, Wis., Danville Malleable Iron Co., Danville, Ill., and Grand Rapids Malleable Iron Works, Grand Rapids, Mich., among others. In 1936 he became shop practice engineer of the Malleable Founders' Society, Cleveland, and field assistant to Prof. Enrique Touceda, whom he succeeded as consulting engineer when the professor died in 1943.

Profits will be based on: Efficiency in molding, coring, melting, pouring, cleaning; equitable labor rates and material costs for such products as sand, pig coke, scrap; uniform methods of cost compilation; efficiency in planning and scheduling, with prospects of penalties for non-fulfillment of contract and for cancellation; efficiency in selling, delivery and collections; and uniform trade practices.

How prepare for the forthcoming pressure on casting prices? Among the foremost methods, one important one will consist of packing more quality into the product.

Several channels are open to offer:

1. More castings for the same money.
2. Better castings for the same money.
3. Higher quality metallurgy for the same money (Alloying, inoculating, properties control).
4. Better finish (Less work for the consumer).
5. Better machinability.

These all add up to packing more quality into the product. Nothing succeeds like quality.

Future Development—Now it is time to pause and sniff the direction of the wind for 1948. A political scent is strong, and the air is filled with economic editorializing. Here is some of it:

"National income, 5 billion dollars in 1932-1934; 100 billion in 1940-1941; 195 billion in 1946-1947; 14 billion dollars out of profits for plant and equipment during 1948. A mild recession might produce a depression for many companies. Costs have raised the 'break-even' point. An era of unhealthy economics. Future deflation must be short lived due to large savings and a large demand for goods by individuals, federal government, local governments and companies. Classic means for resisting inflation are 'work more—spend less'.

Price-Wage Tie-in

"Labor problems: 60 million jobs, 15 million or 25 per cent of the total in manufacturing. Productivity increased 27 times in the last 100 years with only nine times greater labor force working 40 hours vs 70. Workmen less 'well off' on basis of real earnings in comparison with present prices. Wages are increasing as productivity increases. CIO-SWOC handbook states 'greater productivity guided by efficient management will produce lower costs per unit'.

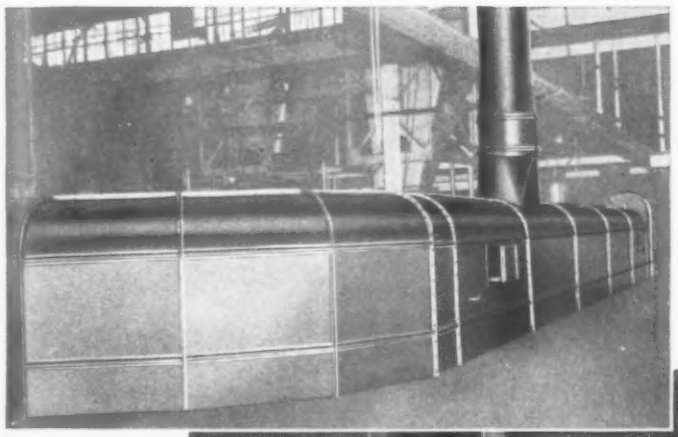
"Who wants lower prices? Prices should be high enough to pay adequate wages and provide adequate profit. Talking to workmen about lower prices is more important than talk about higher wages. Prices rising above income, prosperity cannot continue unless people can buy. Resistance to increased prices requires greater effort to get greater output per dollar. Depression may come from stagnation of purchasing power. Depression may come from a drop in farm prices accompanied by a recession in farm equipment buying. Sustain purchasing power by constructive methods of taxation. Panics in the past have been tied in with lost purchasing power because of prices getting out of balance.

"We are approaching the end of war-induced shortages. Many profits

(*Concluded on page* 140)

Single KIRK & BLUM SYSTEM

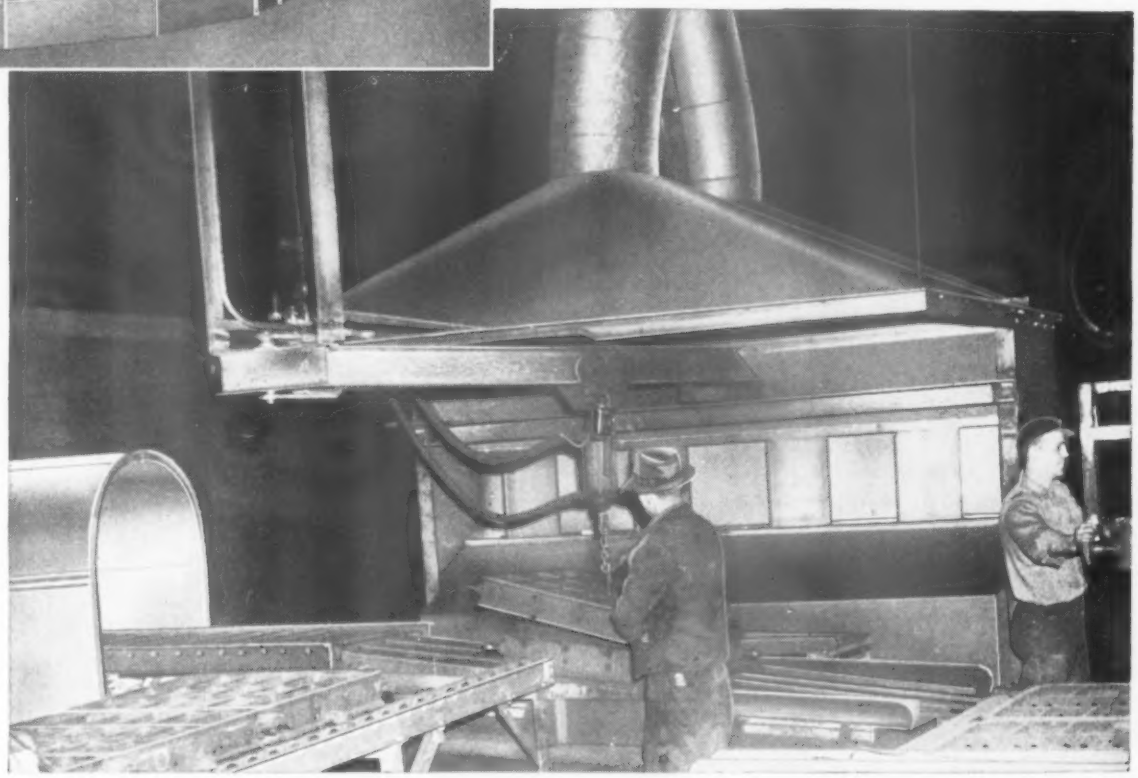
WORKS Three WAYS!



1. Removes Fumes

2. Cools Molds

3. Removes Dust



In the plant of a leading manufacturer of cast iron radiation one KIRK & BLUM System does a three-fold job, cooling molds and controlling fumes and dust.

After casting, the molds enter the cooling tunnel seen in the small photo; a large volume of air passes through the tunnel, cooling the molds and removing the fumes. The molds are then delivered to the shakeout, where clean air flows over the grate . . . keeps workers at top efficiency. In the lower photo note the adjustable volume control plates in the shakeout hood which permit easy control of air where needed.

This Kirk & Blum installation is another example of the skill and experience of Kirk & Blum Engineers . . . experts with air. If you want to control fumes, dust or cooling, Kirk & Blum Engineers will gladly offer their recommendations without obligation. The Kirk & Blum Mfg. Company, 2808 Spring Grove Ave., Cincinnati 25, Ohio.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

DUST CONTROL SYSTEMS

(*Concluded from page* 138)

have been inventory profits. When loans are increasing in anticipation of sales that do not occur, you borrow your way into a depression. Consumer credit 6 billion in prewar 1939, 9 billion in early war 1941, 5 billion in midwar 1944, 11 billion in postwar 1947. With restrictions off, further increase is expected. No down payment—15 months to pay. During 1946, 65 per cent of the families saved money; 7½% broke even; 27½% or about 12,500,000 'went into the hole' and spent more than they earned. Exporting twice as much as we import results in an upward pressure on prices. You can't flood a reservoir if you are draining it faster than you are filling it. Excessive exports, inventories and equipment will lead to a slump and slowdown. Business incentive with tax plans. High tax rates which choke capital accumulation."

Some Personal Observations

The following economics are purely my own, synthesized from the welter of wailing that comes through the press daily. As long as we tax ourselves to buy government services that we cannot afford, and buy more goods at higher prices for export, with only partial reimbursement, we can enjoy this self-inflicted punishment until it hurts. It will feel good when it stops. The stop may be provoked by shutting down foreign and domestic credit, exhausting buying power, subsidies, high taxes, reduced farm and commodity prices. When the stop comes, painful corrective measures with readjustments in working conditions, costs and production will result. These painful experiences are a necessary evil of our economy. We have had them many times before in our history and survived. We hope for less violent reactions and hope to survive again.

For the gray iron foundryman, dangers lie ahead in lack of price stability, poor quality of raw materials, poor cost systems, poor housekeeping and poor merchandising, as expressed by the Gray Iron Foundries' Society.

Casting output is now limited to the availability of raw materials. Further limits to increased output may come from a resistance to higher prices or from an unbalanced economic condition, leading to an industrial letdown. Alternately, with an unlimited supply of materials, a greater output can be made at prevailing or slightly higher prices, much of it won through the greater productivity per man, leading to lower costs per job.

There are casting consuming industries which have not yet reached their full stride of productivity necessary to maintain the usual economic balance. Among them are the automotive, sewing machine, steam and power, construction, mining, builder's hardware, plumbing goods industries. In contrast, stabilization is near or has been reached in machine tool, metalworking, aeronautical, housewares such as stoves and flat irons, rubber, chemicals and some parts of agricultural industries. Other industries in which much remains to be done are the railroad, ceramic, cement, textile, power, paper, lumber, packaging, bottling. canning, glassware and electrical goods. In the field of heavy casting consumers such as pipe, railroad, car wheels, ingot molds, rolls, road and construction machinery, the situation is still much out of balance and in favor of increasing production.

The auto industry with 5 million units produced and capable of making 6 million, represents a field able to absorb 15 per cent of the prevailing gray iron castings. At the present rate of production, it would take six years to replace vehicles in the country and still not provide for the prewar depreciation rate of a turnover each two years instead of six. In other lines such as housewares, stoves, etc., there is evidence that the supplies are matching the demand. This is also shown in the surplus of squeezer molding capacity which is turning owners of these new shops into other lines than those that projected them into business. These new shops are not necessarily surplus, but they will be compelled to turn their equipment into other lines of work. There is a tremendous outlet for gadgets, many of them like the non-refillable bottle to be used once and thrown away. They must be bought at low cost. They are the household hardware and hand tool items of the 5 and 10c stores and hardware bazaars.

Lists Squeezer Applications

Among the many squeezer items that fit these applications are the spanner wrenches, socket wrenches, shears, tongs, hammers, vises, clamps, pins, spikes, bolts and similar tools which the purchaser uses for a temporary repair and then throws away. Other items are ornamental iron, picnic stoves, pots, pans, miscellaneous household goods which wait for the foundryman's hand to produce them at low cost.

The steel industry has always been a pacemaker for the iron foundry in its statistical relation to tonnages melted. Recently, iron foundry tonnage has been moving into consumer goods at a faster rate than steel. This may indicate a broader acceptance of castings in engineering activities. Some of the excess is related to the suspended wartime demand during which steel production took priority. The long-term trend of the demand for steel indicates that a huge chasm of unfilled needs was created in the 1930 to 1940 decade. It would take 10 years of steady production at prevailing rates to fill the chasm, replace equipment worn out during the process, and maintain our plants and activities at the prewar standard of the more-abundant life. Political factors and the popular appeal of various pressure groups may swing the line and roughen up the chart with the inevitable peaks and valleys, but gray iron casting production, with more to gain than lose, should, like steel production, sail onward and upward for a long time to come.

In conclusion, I remain eternally grateful to many of my friends in the industry whose work may have escaped specific identification. Wherever my memory served me promptly, specific references were made of contributors, by name.

Sources of Illustrations

Fig. 1—Foster Wheeler Corp., New York.

Fig. 7—Joshua Hendy Iron Works, San Francisco.

Figs. 8, 9, 11—Lynchburg Foundry Co., Lynchburg, Va.

Fig. 10—Schneider, Bowman Co. Inc., Philadelphia.

Fig. 12—Chemung Foundry Co., Elmira, N. Y.

Fig. 13—Westinghouse Air Brake Co., Wilmerding, Pa.

Fig. 14—Allyne-Ryan Foundry Co., Cleveland.

New York Office Is Opened by Knight

Lester B. Knight & Associates Inc., consulting engineers, Chicago, opened a New York office on Jan. 1. Addition of the new branch office at 30 Church St., will enable the Knight organization to offer a more comprehensive service in foundry management, industrial and plant engineering to eastern clients.

In charge of the New York office and manager of the Industrial Engineering Division is E. E. Bradway. J. M. Planten is in charge of plant engineering, and R. L. Ogden manager of plant surveys and operation.

In February, 1947, Knight moved to larger Chicago headquarters and increased the engineering staff to 35 men.

FOUND . . . . . at last!

a practical LIGHT for FOUNDRIES

HERE'S THE ANSWER

Here's a lighting fixture with permanent lighting efficiency. A double wall (see "A" above), hermetically sealed, one piece removable glass reflector—the glass outer walls (see "B") protect the special high reflecting silver, spun coated on the inside (see "C") of the double glass walls.

Glass protects silver from darkening or discoloring, the dead air space between two walls of reflector acts as an insulator against heat of lamp—preventing cracking, checking or peeling of silver. Can easily be cleaned without removing from fixture with any solution and will not harm silver.

Ask to see "The Midwest Champion," the light that pays for itself in no time. Increase production, cut down rejects and reduce accidents. NOTHING COSTS LESS THAN THE BEST LIGHT.

Write Today

Write today for catalog No. 9. Take the first step towards better production NOW.

The Midwest Lighting Products Co.

1357 BEACH PARKWAY
CLEVELAND 7, OHIO

Activities of Foundry

GROUPS

Central Illinois

APPROXIMATELY 110 members and guests of Central Illinois Chapter of the AFA heard G. P. Halliwell, director of research, H. Kramer & Co., Chicago, discuss "Nonferrous Foundry Practice" Nov. 3 at the chapter's regular monthly meeting in the Jefferson Hotel, Peoria, Ill.

Chapter Chairman A. V. Martens, Pekin Foundry & Mfg. Co., Pekin, Ill., presided, and Charles W. Bucklar Jr., Superior Foundry Co., Peoria, was technical chairman.

Mr. Halliwell covered the nonferrous field in an interesting and informative manner, and a lively discussion followed his talk.—*V. W. Swango.*

Metropolitan

A GENERAL review of present day foundry difficulties with respect to raw materials and unavailable materials was presented by F. W. Hanson, Electro Metallurgical Co., New York, before the Metropolitan Chapter of the AFA, at the Essex House, Newark, N. J., Nov. 3.

Mr. Hanson suggested possible substitutes which would be helpful in producing high quality castings. Particularly stressed were carbon control and sulphur problems which are outstanding in practically every foundry today. Possible steps for improving the situation in respect to these elements were covered briefly.

The use and function of various alloying elements and the making up of deficiences were covered. Innoculation of iron to improve physical properties together with suitable innoculating materials were discussed at length. Specialty irons for purposes such as heat resistance and abrasion resistance were also reviewed briefly.

Kenneth A. DeLong, chapter chairman, presided, with George E. Hadzima serving as technical chairman.

The educational program consisting of ten lectures on fundamentals of good foundry practice was called to the attention of all present. A motion picture related to the topic of the evening is shown at each session. The course is designed to give foundry technologists and apprentices latest data on practical production techniques and to add to their knowledge of the metallurgy of castings. Registration fee of $2 is charged for the course, and George F. Watson, assistant chief chemist, American Brake Shoe Co., Mahwah, N. J., is in charge of the general registration.

The lecture course was started Nov. 17 with the presentation of the first session at Sussex Avenue Vocational School, Newark. "Core Blowing" was the topic with G. W. Lederman, Lederman & Baessler Inc., as speaker. An industrial movie, "Ferrous Castings," was shown.

Subjects and dates of the remaining lectures are: "Engineering of Sand," Jan. 12; "Melting of Nonferrous Alloys," Jan. 26; "Gating and Risering of Nonferrous Pressure Castings," Feb. 9; "Practical Solution of a Difficult Casting Problem," Feb. 23; "Foundry Sand Control," Mar. 8; "Complete Planning and Producing of a Casting," Mar. 22; "Elementary Foundry Cost Methods," Apr. 12, and "Modernizing the Foundry," Apr. 26.—*W. H. Ferguson, Electro Metallurgical Sales Corp.*

CENTRAL ILLINOIS Chapter of the AFA heard G. P. Halliwell, director of research, H. Kramer & Co., Chicago, discuss "Nonferrous Foundry Practice" at its Nov. 3 meeting. Shown above in discussion with Mr. Halliwell are, left to right: Robert Dickenson and George Hazen, Brass Foundry Co.; Mr. Halliwell, and C. W. Bucklar Jr., Superior Foundry Co.

Southern California

TO Harold E. Henderson of the H. C. Macauley Foundry Co., Berkeley, Calif., foundry sands are at once the simplest and most complex materials used in the foundry business.

"All there is to any sand," he told AFA Southern California Chapter's November meeting, "is water, clay and silica grains. Yet the kinds and proper proportion of these ingredients can differ in ten thousand ways, each of which can have a direct effect upon castings made against them."

Highlights in Mr. Henderson's talk included:

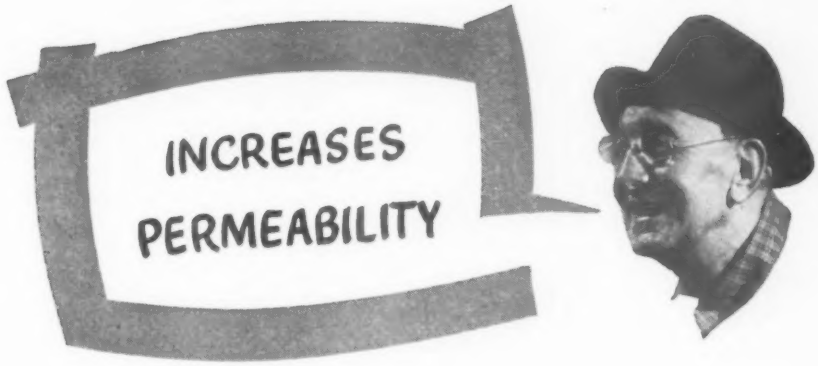
If you don't have anything else in the way of equipment, be sure to have muller and aerator.

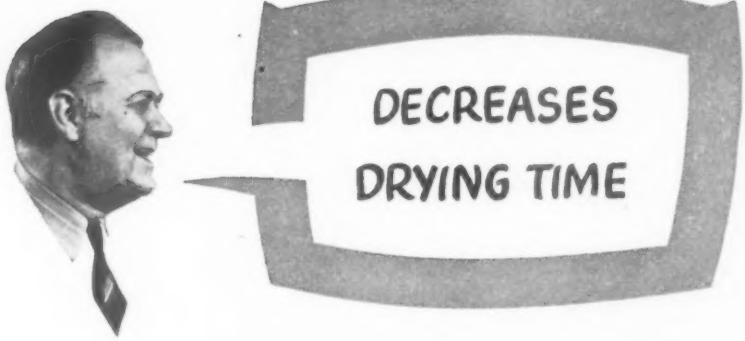
When troubles arise look first to your moisture content. While this can vary up to 7 per cent, the exact amount in any heap is a vital bit of knoweldge.

The rule of four for iron foundry troubles can be summed up in four admonitions, depending upon the nature of the difficulty. The four: Add silica, add bentonite, ram harder, cut down moisture.

The old time molder judged moisture by rule-of-thumb methods which were often surprisingly accurate. Modern foundry workers have not been forced to learn "rule of thumb" because of the preponderance of "scientific" guides available in all classes of operations. Therefore, when the science fails, all fails unless there's a backlog of practical knowledge in somebody's head with which to meet the emergency. Moral: Science is good; good men

(*Continued on page* 146)



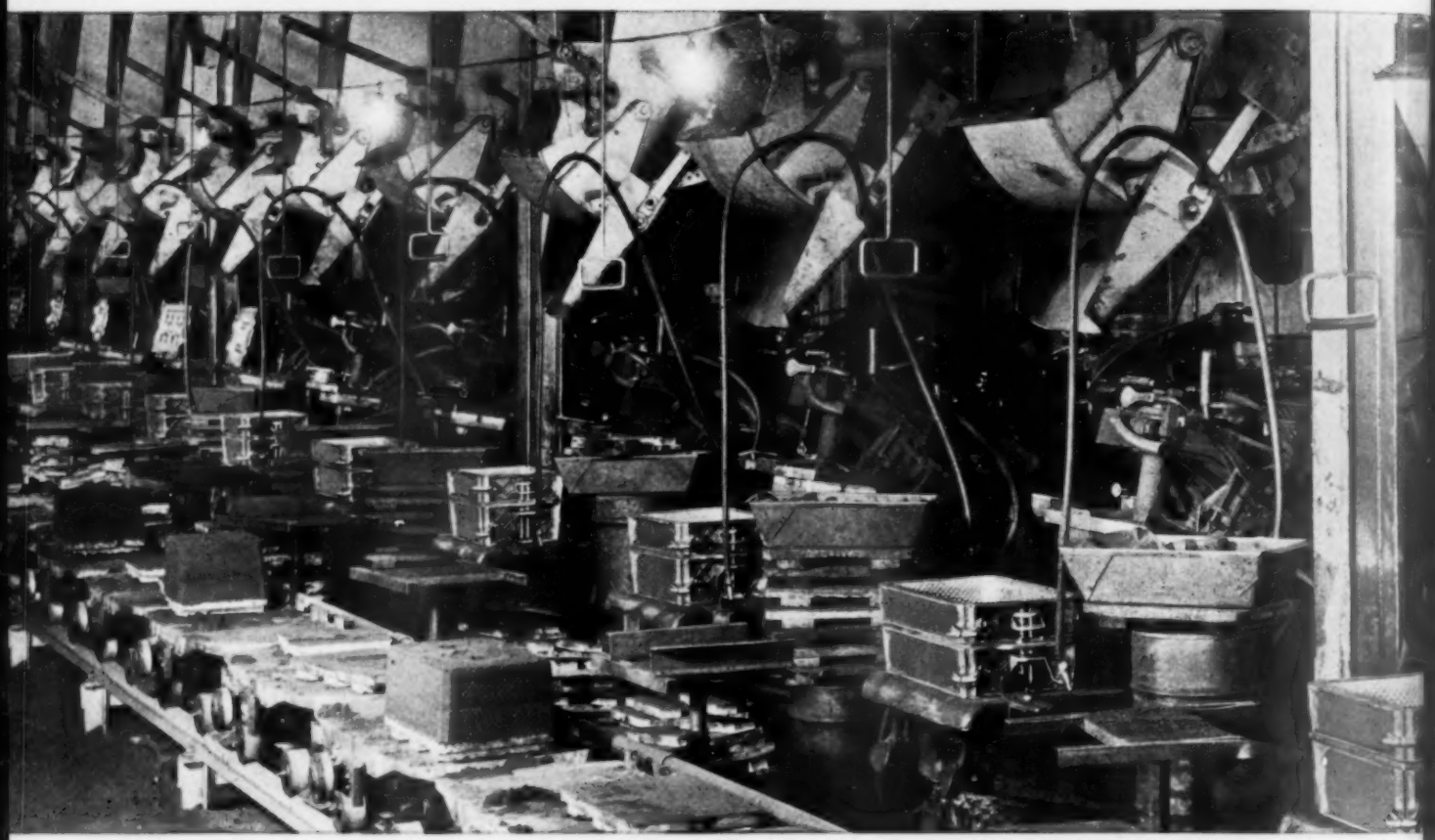


Foundry management, watching mounting costs, sees profits in MOGUL. This perfect Green Bond makes money because it decreases drying time, yields smooth cores and reduces discards. MOGUL works profitably with pitch or resin because cores can be handled warm. For both green and dry strength use MOGUL in cores.

KORDEK is an equally perfect Dry Bond. Used in smaller quantities than most dry binders, KORDEK produces better quality castings with fewer discards.

CORN PRODUCTS SALES CO.
17 BATTERY PLACE
NEW YORK 4, N. Y.

OSBORN SQUEEZERS

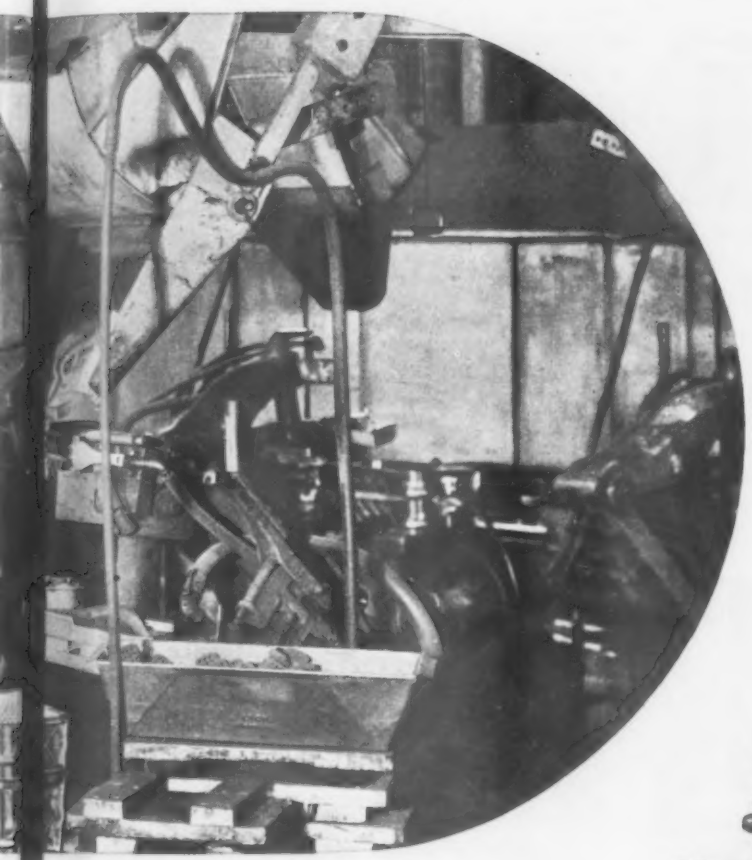


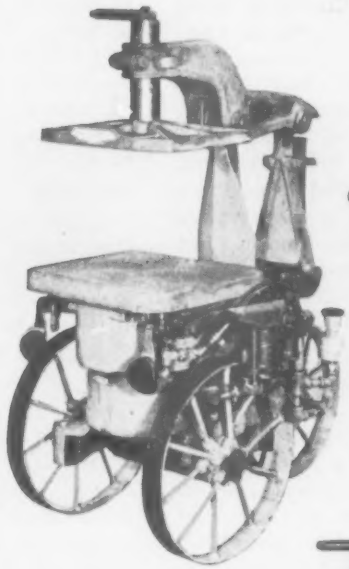
Portable and stationary models, cantilever or post type heads, squeeze pistons 10 to 18 inch diameters, wide range of table sizes—you'll find the one unit in the Osborn line of Jolt Squeezers that best meets your specific needs.

And, whatever your choice, you're assured the accuracy, economy and ease of operation that have made Osborn Jolt Squeezers the production standard of the foundry industry.

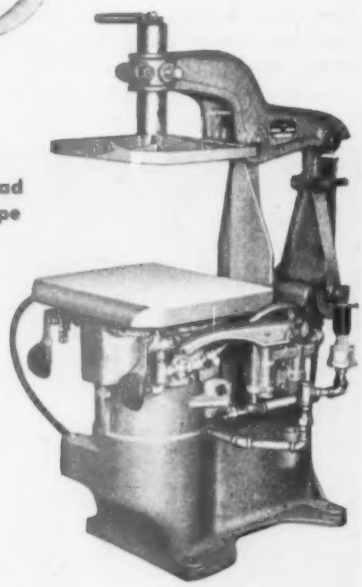
THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

A SIZE AND TYPE FOR EVERY PRODUCTION NEED....

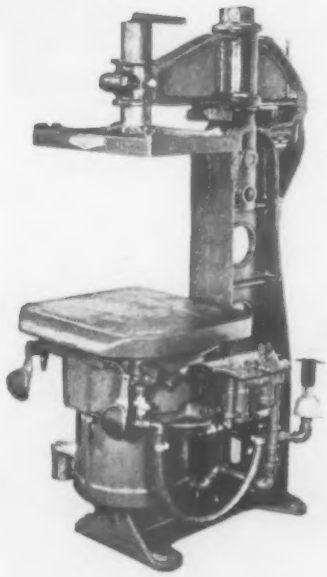




Cantilever Head
Portable Type



Cantilever Head
Stationary Type



Stationary
Post Type

STANDARD EQUIPMENT

Osborn Jolt Squeezers are furnished as standard equipment, complete with Closing and Riddle Racks, Vibrator with chrome plated bore, Blow Gun and Automatic Squeeze Pressure Release Valve for automatically maintaining a predetermined squeeze pressure on each mould.

OSBORN

MOULDING MACHINES CORE BLOWING MACHINES

MEMBER
MANUFACTURER'S ASSOCIATION, INC.
FOUNDRY EQUIPMENT

(*Continued from page* 142)
are still better.

Keep your notes on sands in loose-leaf form. It will enable you to toss away the faulty more readily and substitute the sounder information.

Like greenest grasses, foundrymen think the best sands are always over the fence and far away. Hence southern Californians send north for their sand, northern Californians send south; easterners send west and westerners are always after anything that doesn't come from their own back yard. West coast sands are among the best anywhere.

Chapter President Hal Russill announced that classes for apprentices will open shortly at Huntington Park High School and urged members to see that all apprentices are enrolled. —*Maurice Beam.*

New Jersey

WHILE looking for little early improvement in the merchant pig iron situation, J. A. Claussen, representative, Committee on Merchant Pig Iron, American Iron and Steel Institute, New York, told members of the New Jersey Foundrymen's Association, Nov. 17, that supply and demand are not far from being in balance.

He said that a balance could be reached if blast furnaces were only able to overcome the present loss of 10 to 12 per cent in production due to the poor quality of coke resulting from the inferior quality of coal available.

The government has initiated steps to limit exports of metallurgical coal to minimum needs and this in time will help to some extent. Also, coal washing equipment is being installed at various plants to improve coke quality and this eventually will be reflected in better output of merchant pig iron.

However, the outlook for the coming winter and probably for some time beyond is not too encouraging, Mr. Claussen said. Further, he looked for little relief from abroad. Up to Sept. 1, he pointed out, imports have actually exceeded exports by about 13,000 tons, with exports going to countries normally dependent upon the United States for supplies.

A major complication is the extreme shortage of scrap, which has increased the demand for pig iron. While no important relief is in sight, programs started by government agencies in July, 1946, are now bearing fruit, and activities of the Steel Foundry & Scrap Industries Committee for expediting iron and steel scrap should result in increased flow of material from various sources.

He complimented the gray iron casting industry for being able to achieve a new record annual rate of production of approximately 13,000,000 tons—all in spite of material shortages, labor and other difficulties. He said the merchant pig iron industry is now closing a year of record production of foundry and malleable pig iron for sale, at an annual rate equal to about 5,100,000 net tons, or 135 per cent of the 1940 rate.—*Ben K. Price.*

Canton

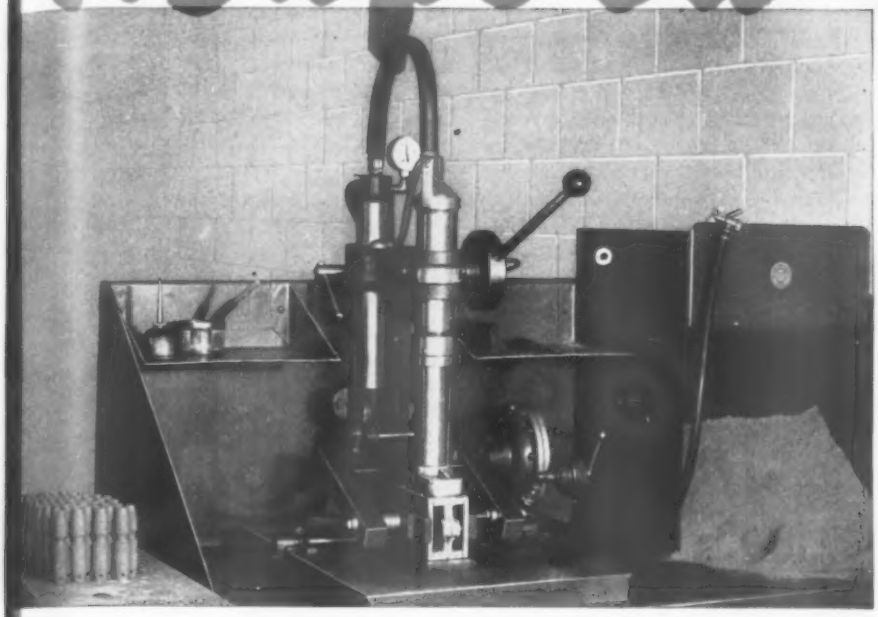
ROUND-TABLE discussions featured the November meeting of Canton District chapter of the AFA which was attended by 115 members and guests. Leaders of the four discussion groups were: Steel—C. L. Fornwalt, Atlantic Foundry Co., Akron, O.; gray and malleable iron—Carl Hall, American Cast Products Inc., Orrville, O.; time and motion study—T. C. McFall, American Steel Foundries, Alliance, O., and core

(*Continued on page* 148)

CHICAGO Chapter of the AFA had 225 members and guests at its meeting Oct. 6 at the Chicago Bar Association. Seated at the speakers' table left to right (view at upper left) are: Chapter Vice President Chester K. Faunt, works manager, Christensen & Olsen Foundry Co.; Chapter President Fred B. Skeates, foundry superintendent, Link-Belt Co.; Guest Speaker J. B. Caine, metallurgist, Sawbrook Steel Castings Co.; Guest Speaker H. R. Youngkrantz, metallurgist, Apex Smelting Co., and Chapter Secretary Victor M. Rowell, sales technician, Velsicol Corp.

Redford

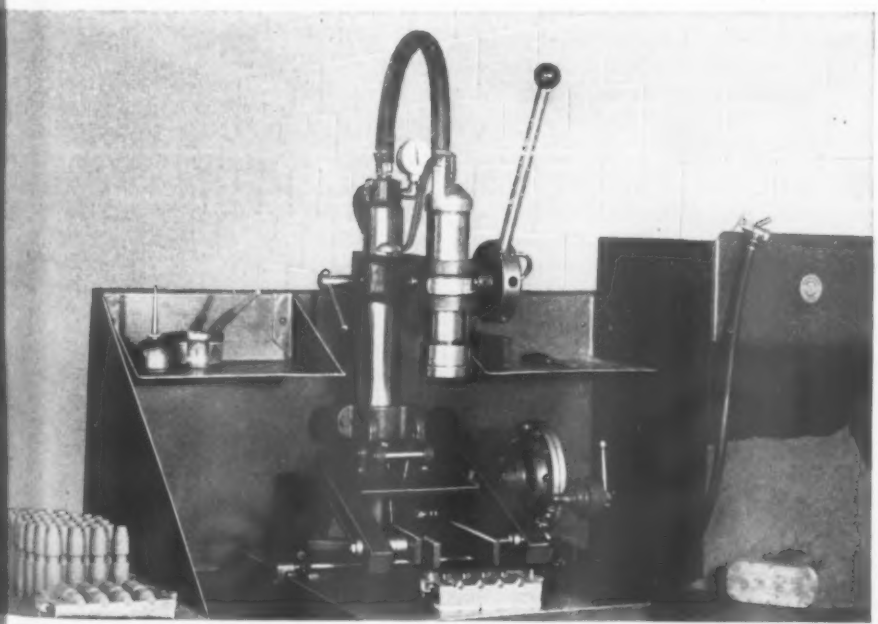
CORE BLOWER CARTRIDGE TYPE



NEW AIR OPERATED CORE BOX CLAMPING ATTACHMENT

At the request of hundreds of Redford users, we have developed the NEW AIR OPERATED CORE BOX CLAMPING ATTACHMENT, for blowing vertically split core boxes, as shown in operation in photographs.

Permits maximum table clearance—simple to install and operate—can be swung to one side to clear table for blowing horizontally split core boxes.



• PROVEN •

Hundreds of foundries are using Redfords as an efficient low cost means of producing small cores. The high percentage of reorders we receive proves that Redfords are profitable to own.

• SIMPLICITY •

The Redford reduces core blowing to its simplest form. Anyone can understand—operate and maintain it.

• SPEED •

All the work of handling core box and driers is done on the machine. Cartridges can be quickly loaded by hand. As many as 200 boxes are being blown and drawn by one operator in one hour.

• FLEXIBILITY •

With a Redford you can make any number of different cores without loss of time for changeovers. Here is what a large jobbing foundry has to say: "We are using 7 Redfords. Your development of the portable cartridge which can be made a part of the core box equipment, has given us all the advantages of core blowing without loss of flexibility so essential to us."

Write today for complete information and new folder

Redford IRON & EQUIPMENT CO.

PHONE: REDFORD 8611

21315 W. McNICHOLS ROAD • DETROIT 19, MICHIGAN

(*Continued from page* 146)
blowing—J. J. Popa, American Steel Foundries.

Chapter Chairman Charles F. Bunting, Pitcairn Co., Barberton, O., introduced Dr. D. C. Williams and Dr. R. P. Schneider, professors at Ohio State University; and William E. Dundon, chairman of the student AFA chapter at the university. These men outlined plans for enlarging the present training program in foundry technology offered at Ohio State to seven or eight courses. They also disclosed that industries in the vicinity of the school had financed or donated much of the foundry equipment.

The coffee talk turned into a trip through the Rocky Mountain National Parks, illustrated by colored slides. The guide was F. H. Kayler, engineer at American Steel Foundries. Some of Mr. Kayler's pictures have won prizes in national competition.—*Nils E. Moore, Wadsworth Testing Laboratory.*

Central Indiana

PROGRAM feature of the regular meeting held by Central Indiana Chapter of the AFA, Nov. 3, at the Athenaeum, Indianapolis, was a question and answer panel. Many of the 100 members in attendance participated in the discussion led by Richard Bancroft, Perfect Circle Co., New Castle, Ind.

The panel of experts consisted of R. E. Coady, Hoosier Iron Works, Kokomo, Ind.; G. C. Dickey, Harrison Steel Castings Co., Attica, Ind., and J. P. Lentz, International Harvester Truck Engine Works; P. L. Hargitt, Light Metals Inc.; Robert Langsenkamp, Langsenkamp-Wheeler Brass Works; Carl Schopp, Link-Belt Co.; W. Zeunik, National Malleable & Steel Castings Co., and Fred Kurtz, Electric Steel Casting Co., all of Indianapolis.

Central Indiana Chapter sponsored the foundry section of the Central Indiana Safety Conference and Exhibit, held Nov. 13-14 at Claypool Hotel, Indianapolis. The safety exhibit featured the latest items of safety apparel and equipment for use in foundries.—*William K. Mitchell.*

Eastern Canada and Newfoundland

APPROXIMATELY 135 members and guests of Eastern Canada and Newfoundland Chapter of the AFA met at the Mount Royal Hotel, Nov. 14, to hear J. S. Vanick, metallurgist, International Nickel Co. Inc., New York, speak on nickel alloys pertaining to gray iron, bronze and steel.

Dividing his talk into a discussion of steel, cast iron and bronze, Mr. Vanick showed slides to emphasize his statements and urged that foundrymen make use of alloys in the development of new fields for castings which were discovered by recent war experiments.

He stated that since productive capacity in gray iron, steel and bronze was not excessively expanded during the war, increased postwar demand could easily keep existing capacity busy for a long time to come. He went on to say that metallurgical processes in the foundry industry follow a pattern common to all melting practices in that metal mixtures are melted down from available raw materials, refined, conditoned, alloyed, given a finishing refinement or treatment, and heated to and poured at controlled temperatures.

He pointed to the progress that has been made in applying well known laws of physics or heat transfer to production of sound castings of high quality. He cited some of the advancements that have been made in low alloy steels and predicted good futures for the bronzes and cast iron.

During the business portion of the meeting, O. L. Voisard, Robert Mitchell & Co. and educational committee chairman, described the chapter's close contact with the staff of the Montreal Technical School in relation to the foundry course being presented there. He announced that the technical paper contest, inaugurated last year with such success, is being continued this year.

Chapter Chairman A. E. Cartwright, Crane Ltd., expressed regret at the death of E. Tyler, Canadian Car & Foundry Co. Ltd., who was an active chapter member.—*H. E. Francis, Jenkins Bros. Ltd.*

EASTERN CANADA & NEWFOUNDLAND Chapter of the AFA heard a talk by Ralph L. Lee, department of public relations, General Motors Corp., Detroit, at its first meeting of the season, Oct. 14. At left, Mr. Lee is shown as he addressed members and guests of the chapter shown below

Western New York

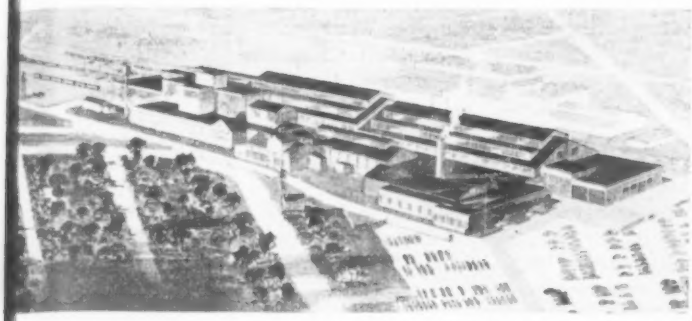
APPROXIMATELY 100 members and guests attended the Nov. 7 meeting of the Western New York Chapter of the AFA, held at Hotel Touraine, Buffalo, Elliot R. Jones, chapter chairman, presided at the business meeting which followed dinner for about 65, and introduced guests from the neighboring Northwestern AFA Chapter, as well as from Niagara Falls, Lockport, Batavia and Attica, N. Y. The meeting was turned over to Vice Chairman Martin J. O'Brien Jr., who acted as technical chairman. Guest speaker was D. P. Hepler, consulting engineer, Albert Ramond & Associates, New York, who discussed job evaluation and direct and indirect incentives for foundries.

Mr. Hepler described in detail the point system, in connection with evaluation of jobs, and described several other approved methods. He stressed particularly the unilateral and bilateral methods, pointing out the desirability of a job evaluation committee, consisting preferably of four committeemen, two representing the company and two the union. He stated that such a committee should be assigned to complete the work of job description. The speaker also discussed wage scale negotiations.

The speaker then covered the problem of incentives and discussed the importance of a standards de-

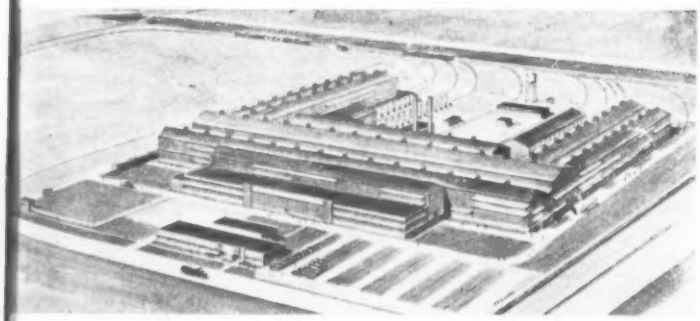
(*Continued on page* 150)

Ford Motor Co.—Rouge Plant—Dearborn, Mich.



Unitcast Corp.—Toledo, Ohio

General Steel Castings Co.—Madison, Ill.

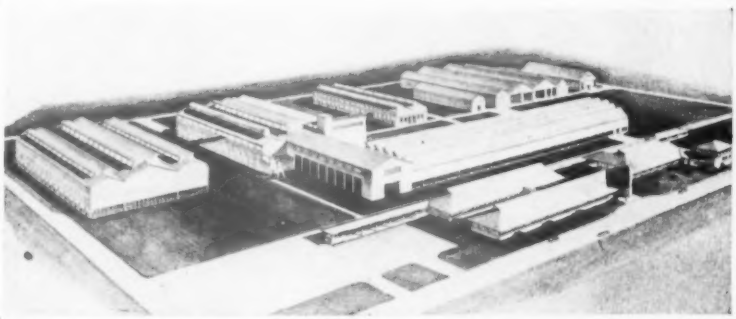


Columbia Steel Co.—Pittsburg, Cal.

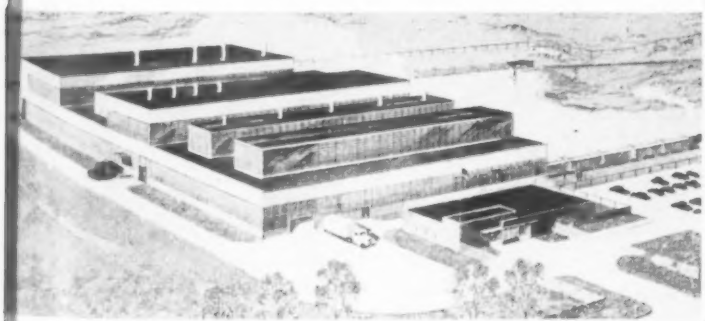
GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION

1000 MARQUETTE BUILDING, DETROIT

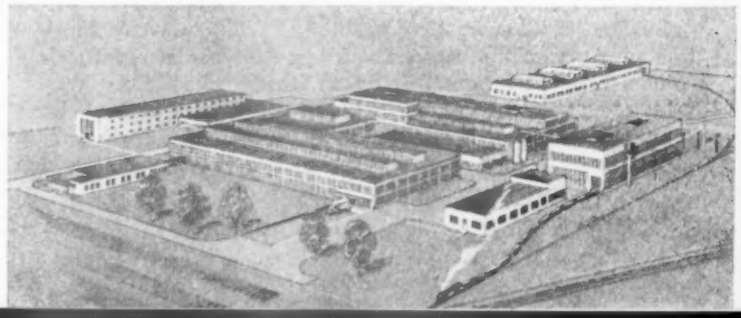


Brazilian Railroad Equipment Co.—Sao Paulo, Brazil



Auto Specialties Mfg. Co.—St. Joseph, Mich.

Ohio Steel Foundry Co.—Lima, Ohio



ENGINEERING SERVICES FOR THESE FOUNDRY PROJECTS

(*Continued from page* 148)

partment to determine costs, particularly for time study education in the foundry. Mr. Hepler illustrated with a blackboard the importance of securing basic data, using coremaking as an illustration. The problem of piece-work study was also discussed thoroughly. Following the talk an interesting discussion was held, and a vote of thanks was extended to the speaker. — *Fred L. Weaver, Weaver Materiel Service.*

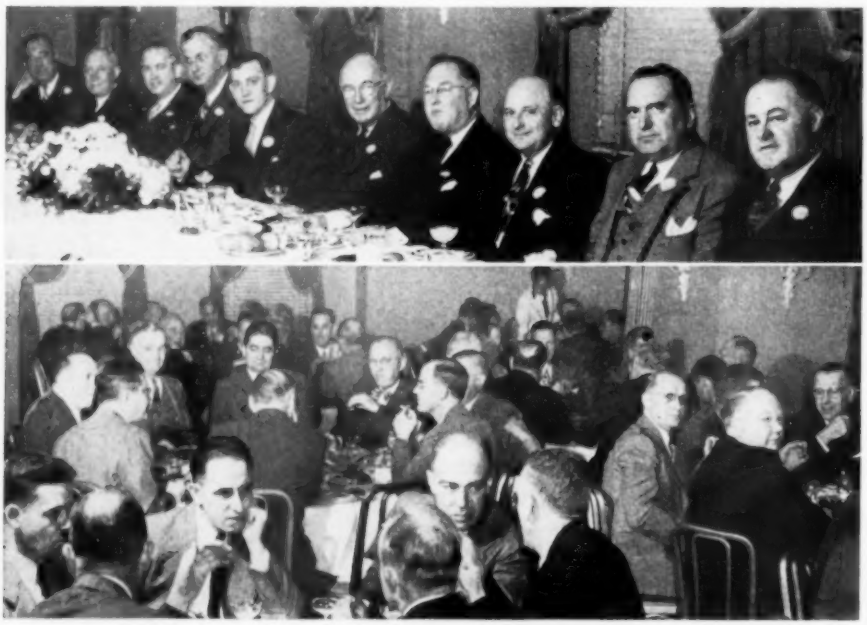
No. Illinois and So. Wisconsin

NOV. 11 meeting of Northern Illinois and Southern Wisconsin Chapter of the AFA, held at Beloit (Wis.) Country Club, was attended by about 75 members and guests. William B. Wallis, national vice president of the AFA, and William Maloney, national secretary, represented the Chicago office for National Officers' Night. Mr. Maloney reported on activities and functions of the headquarters office and Mr. Wallis gave a short talk on his recent trip to Europe. He observed that the greatest need there was for fuel and clothing and stated if they were given these they could provide their own food. He referred especially to France and Germany.

George Antonic, Walter Gerlinger Inc., Milwaukee, technical speaker of the evening, gave an interesting talk on chemically treated sand. He described the process used in preparation of the molding sand, which uses a coating on the sand grain for refractory and working properties. With this in mind the chemical can be considered a physical mixture instead of a complex chemical composition which it actually is. The coating material contains almost pure carbon resin, solvent, catalyst, an emulsyfing agent and water. The speaker described use of the material after it is received in the foundry. Addition of a solvent to activate the plastic, addition of clay or bentonite in the conventional manner, and water to make the sand workable, make the material ready for use. Cereal binder may be used if required.

After each reuse, the sand is rebonded. Obviously, the coating on the grain next to the casting will be burned off. In addition, uncoated core sand infilters into the system and must be coated in the mulling cycle preparatory to the next use of the sand. Setting of this additional material is done by radiant heat given off by the casting at the pouring and solidification period. Amount of plastic required depends on weight of the castings and amount of core infiltration.

Mr. Antonic then explained why a chemically coated sand is useful in molding technique. Since the sand in the mold does not remain inert material when it comes in contact with metal, the new process attempts to improve this condition by carefully coating each grain with carbon, making the sand grain inert to the oxide. —*Carl L. Dahlquist, Greenlee Bros. & Co.*



PHILADELPHIA Chapter of the AFA held its second annual Management Dinner at the Drake Hotel, Philadelphia, Nov. 5. The speakers' table is shown in top view above. Left to right are: W. B. Coleman, W. B. Coleman & Co.; Dr. Guilliam H. Clamer, Ajax Metal Co.; William W. Maloney, American Foundrymen's Association; Harry E. Ladwig, Allis-Chalmers Mfg. Co.; E. C. Troy, Dodge Steel Co.; Clarence J. Tolan Jr., Dodge Steel Co.; W. B. Wallis, Pittsburgh Lectromelt Furnace Corp.; B. A. Miller, Cramp Brass & Iron Foundries Division, Baldwin Locomotive Works; John M. Robb Jr., Hickman, Williams & Co., and C. L. Lane, Florence Pipe Foundry & Machine Co.

Central Ohio

AT THE Nov. 24 meeting of Central Ohio Chapter of the AFA, held at Chittenden Hotel, Columbus, two technical sessions were held. Prof. Howard F. Taylor, Massachusetts Institute of Technology, discussed "Gating and Risering" before the steel group, and Wilfred H. White, Jackson Iron & Steel Co., Jackson, O., was speaker for the iron session, using "Foundry Problems and their Correction," as his subject.

Professor Taylor confined his illustrated talk mainly to risering of steel castings. The use of inert riser compounds, exothermic riser compounds and insulated risers was shown to offer possibilities for increasing the yield and improving soundness of steel castings. Inert riser materials are easiest to use and are the least expensive but are also the least effective in promoting feeding of the castings. By reducing radiant heat loss from the riser, however, they do perform a useful function.

Exothermic riser materials, which actually produce additional heat by chemical reaction, are considerably more effective than the inert type, when properly used. Use of exothermic additions to the top of deep risers was shown to have little effect upon feeding of castings and such use was shown to be economically wasteful. Prime advantage of exothermic riser compounds lies in their ability to permit riser heights to be drastically reduced. The speaker showed examples of castings in which yield was increased from about 40 per cent to a yield of about 95 per cent by use of short risers which were kept fluid by exothermic additions after the castings were poured. This method is being widely applied to large castings in a number of production shops and is resulting in large increases in yield.

Use of insulated sleeves as risers has worked out successfully in nonferrous casting and has been adopted by some commercial plants. The method is highly successful in increasing yield and improving sound-

(*Continued on page* 152)

NEW HUTCHINSON CRADLE TONG LENGTHEN CRUCIBLE LIFE UP TO 300%

Over!——loading is quick and easy as tong is dropped over the crucible. Note that crossbar stops it at the proper height. Light-weight, sturdy construction appeals to workmen, assures trouble-free service and long-life.

Up!——Four cast-steel pads supported by a heavy ring carry the crucible. By holding down on the levers, the operator lifts the pads to a "free" position to clear the bilge. In position over the crucible, the levers are released, the pads drop into place (automatically adjusting themselves to the crucible contour) and the tong is loaded!

And out!——crucible is released with ease as its weight is placed on the floor by merely "squeezing" the levers. The wedge action of the pads is ample to handle all normal variation in dimensions and is self-compensating for wear.

- NO MORE CRACKED CRUCIBLES
- NO MORE "ARGUMENTS" ABOUT OUT-OF-SHAPE TONGS
- NO MORE "DROPPED POT" ACCIDENTS

* The new Hutchinson Cradle Tong was designed by a foundryman for his own use. Indicative of its contribution to money-and-labor saving in the foundry is the fact that "word-of-mouth" advertising has already placed them in everyday use in nearly 100 foundries in the Middle West.

PATENT PENDING

As illustrated, Hutchinson Tong is designed in an ingenious yet simple manner to pick up a crucible, carrying it without pinching or crushing the sidewalls. There is no squeezing action against the upper walls with the immediately apparent result that crucible-life is extended to a surprising degree. The reports we get from some users is almost unbelievable and all users state that the tongs pay for themselves in short time . . . are worth their cost from a safety standpoint alone.

Their moderate cost will impress you and we invite you to write for prices. Hutchinson Cradle Tong is available for handling crucibles, sizes 40 to 400.

Ask for Price List "F"

SALES TERRITORIES AVAILABLE

We invite correspondence with Foundry Supply Houses and Agents interested in handling this new foundry aid.

THE HUTCHINSON COMPANY

Edwardsville, Illinois

(St. Louis Suburb)

IF YOU BUY 10 OR MORE CRUCIBLES A YEAR, YOU WILL SAVE MONEY WITH A HUTCHINSON CRADLE TONG.

(*Continued from page* 150)

ness. Method of insulated sleeves, however, has not yet been successfully applied to ferrous castings because of the difficulty of obtaining a sleeve material which is high in fusion point, high in insulating properties, strong enough for production handling and yet readily formed into the variety of shapes and sizes required. Work on this problem is being continued by Professor Taylor. Use of blind, Washburn and Williams and other types of risers was discussed in detail during the period following the talk, and importance of directional solidification, stressed by Professor Taylor, was substantiated by the experiences of several foundrymen present.

Mr. White, in his discussion of foundry problems, cited a series of incidents as examples of what happens when supervision or control is permitted to relax. Stories of contamination of the charge with lead from locomotive wheels, aluminum from engine oil pans, and magnesium from bomb plugs, furnished considerable food for thought. Bed-measuring rods and chains that mysteriously became longer or shorter also provided their share of trouble in the form of cold iron and erratic results.

Another foundry was quoted as strongly approving the use of a separate, well-lighted, and clean blower room sealed from the foundry to prevent entrance of dust and air. The foundry was insistent, however, that in future installations provision should be made for getting air into the room to supply the blower! Another incident pointed out that, although a container may be designed to hold a given weight of coke and be checked at that weight when new, constant handling by the charging crew frequently insures that a miscellaneous collection of bumps, holes and rounded corners will develop and the container will no longer contain the indicated volume.

It was agreed by the listeners that similar problems might arise in their own foundries and that successful operation depends upon constant vigilance to forestall such incidents before they occur.—*H. W. Lownie Jr., Battelle Memorial Institute.*

Wisconsin

WISCONSIN Chapter of the AFA held its regular monthly meeting Nov. 14 at the Crystal Ballroom, Hotel Schroeder. Dr. J. Martin Klotsche, president, Milwaukee State Teachers' College, addressed the 197 members and guests present on the subject "One World—Fact or Fiction."

Dr. Klotsche stated that there is very little likelihood that the United States will have an immediate reconciliation with the Soviet Union. On the other hand, it should not be assumed that war between the United States and the Soviet Union is inevitable. Rather it is likely that the two countries will continue to be openly antagonistic to each other. During this period of friction, according to Dr. Klotsche, this country will have an opportunity to develop a constructive foreign policy.

He went on to say that there are two things that the United States should do as quickly as possible. One is to use available financial resources to aid in the economic recovery of Europe and the other is to support more vigorously the United Nations Organization.—*John E. Hubel.*

Central New York

JAMES LANSING, consulting engineer, Malleable Founders' Society, was the principal speaker at the Nov. 14 meeting of Central New York Chapter of the AFA at Onondaga Hotel, Syracuse, N. Y.

He discussed "Malleable Iron Founding" before 80 members and guests of the chapter. Mr. Lansing's talk covered the malleable iron industry from the discovery of "white heart malleable" in Europe and the so-called "black heart malleable" in this country down to the methods now used in modern malleable founding.

The speaker used a series of slide pictures to show recommended gating and risering practice for the production of sound malleable iron castings.

After a short business meeting which preceded the main talk, George K. Dreher, Foundry Educational Foundation, briefly explained the work that is being done by his organization in the development of trained men for the foundry industry. —*J. A. Feola, Crouse Hinds Co.*

WISCONSIN: Members of Wisconsin Chapter of the AFA on Nov. 14 heard J. Martin Klotsche, president, Milwaukee State Teachers College (above center) speak on "One World—Fact or Fiction." On his right is Walter Edens, Badger Brass & Aluminum Foundry Co., chapter program chairman, and at the speaker's left is R. J. Anderson, Belle City Malleable Iron Co., chapter president. Photo courtesy John Bing, A. P. Green Fire Brick Co.

Timberline

TIMBERLINE Chapter of the AFA held its regular monthly meeting Oct. 28 at Cunningham's Restaurant, Denver. Main speaker for the evening was Frank G. Steinebach, editor, THE FOUNDRY.

Mr. Steinebach discussed progress in the foundry industry since the end of the war, including the application of wartime developments to peacetime production and the tremendous upsurge in the modernization and mechanization of foundry operations. He discussed the basic character of castings in any type of industrial production and indicated that the total output of all types of castings in the year 1947 would approach 16,000,000 tons with a value of nearly $4 billion.

Looking toward the future he stressed the need for greater co-operative efforts, such as has been developed in connection with the foundry education foundation and the Na-

(*Continued on page* 154)

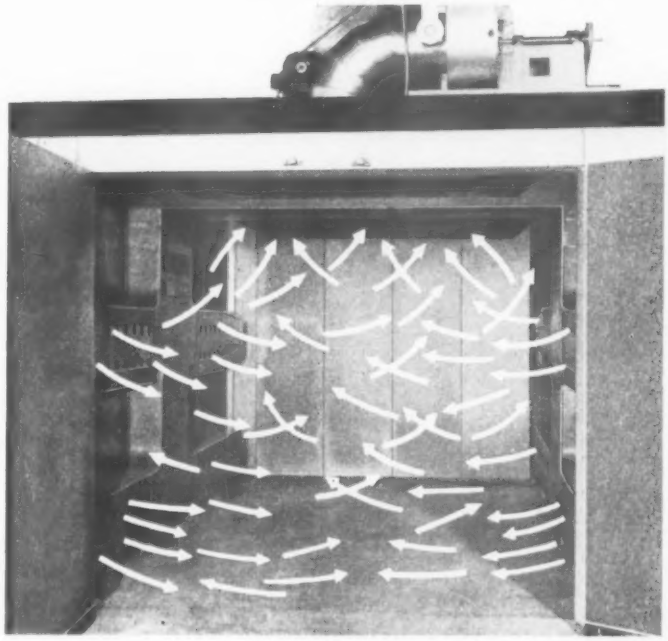
They SERVE . . . SAVE and SATISFY

LANLY OVENS for INDUSTRY

Nothing is more significant of correct design and efficient performance than repeat orders, particularly in a highly competitive field like that of ovens and furnaces.

It is a noteworthy fact that Lanly sales records show an unusually large percentage of such repeat orders. They come, too, from companies whose facilities and personnel enable them to know accurately what performance is being obtained from equipment.

We invite, and sincerely believe that the Lanly record entitles us to receive inquiries for a wide range of equipment for varied operations and services. Write us.



AS INDICATED BY REPEAT ORDERS

OF WHICH THESE ARE A FEW EXAMPLES

CUSTOMER	Year of Purchase 1939	1940	1941	1942	1943	1944	1945	1946	1947	Total OVENS
Gray Iron Jobbing Fdry.			3	1		2	1			7
Aircraft Manufacturer		1		1	3	1	1	2		9
Tire & Rubber Manufacturer						2	4	1		7
Lighting Equipment Manufacturer				1	1		2		2	6
Electrical Resistor Manufacturer		2	1	7	11	1	1		1	24
Motor Bus Manufacturer								10		10
Boiler and Radiator Manufacturer							2	2	2	6
Steel Jobbing Fdry.			2	3			1			6
Pump Manufacturer					1		1	1		3
Steel Jobbing Foundry				4				2		6
Electrical Manufacturer						1	1		2	4
Rubber Manufacturer		2		2			2			6
Refrigerator Manufacturer								4	1	5
Aluminum Jobbing Fdry.				3	1					4
Tire & Rubber Manufacturer	1	1	3	2	1					8
Permanent Mold Casting Fdry.			3	7						10

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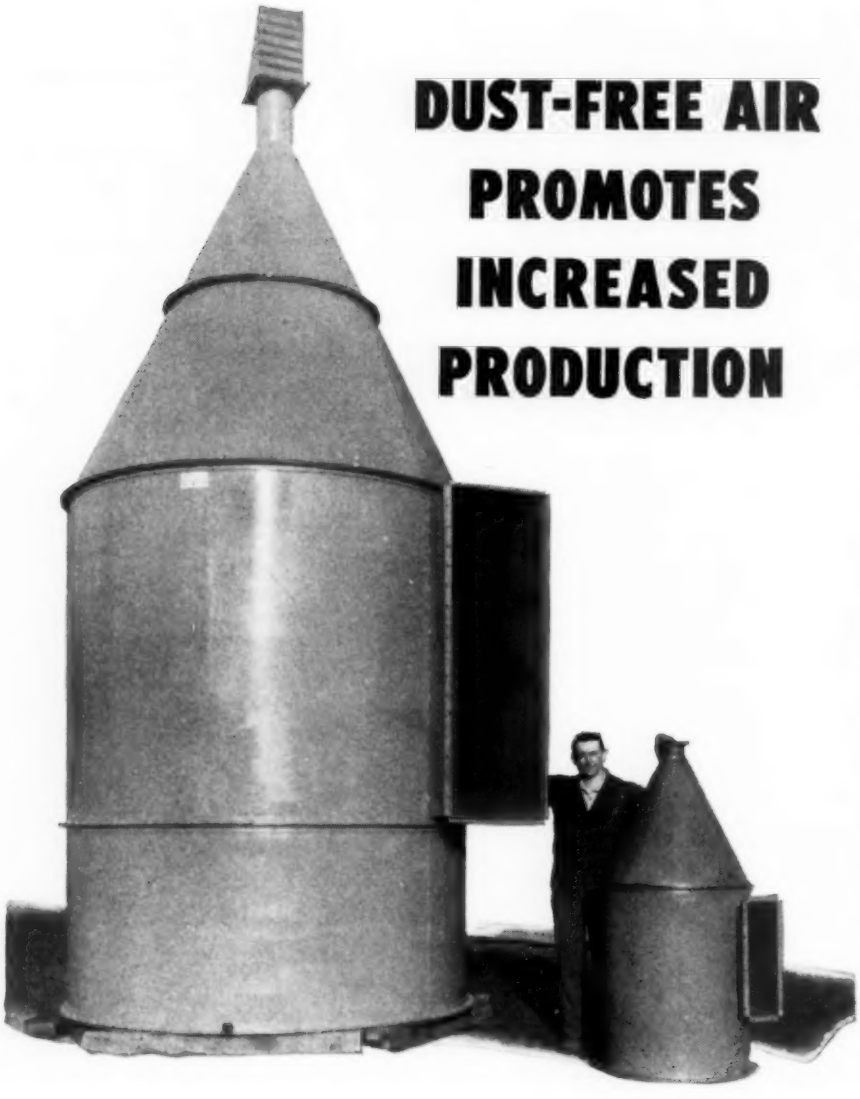

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Goergen-Mackwirth collectors are highly efficient. Their first cost and maintenance is low. They are self-dumping. No cleaning is necessary. There are no replacement bags, plates or oil spray. The only electric current required is for the fan motor.

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Goergen-Mackwirth
ENGINEERING CO., INC.
813 Sycamore Street Buffalo 12, N. Y. Phone: Cleveland 6661
SPECIALISTS IN THE MOVEMENT AND CONTROL OF AIR

(*Continued from page 152*)

tional Castings Council.

C. C. Drake was appointed chairman of a committee for the restoration of Colorado's first foundry at Central City, Colo. Other members of the committee are George E. Tarbox and A. H. Patten.

Educational committee, headed by E. B. Zabriski, reported the new apprenticeship standards would soon be completed along with related training with the co-operation of the Denver public schools. —*Charles E. Stull, Manufacturers Foundry Corp.*

Northern California

ANNUAL golf tournament and outing held by Northern California Chapter of the AFA at Orinda Country Club, Oct. 17, was an outstanding success. John Russo, chairman for the day, did a good job in supervising all arrangements in great detail. Jay Snyder was entertainment chairman.

Guests of honor were Max Kuniansky, national AFA president, and William Maloney, national AFA secretary, who joined in the festivities with enthusiasm.

At the close of afternoon festivities, more than 100 members, guests and friends joined in an enjoyable cocktail hour prior to the dinner served by the club.—*John Bermingham, E. F. Houghton & Co.*

Northwestern Pennsylvania

GUEST speaker at the Nov. 24 meeting of Northwestern Pennsylvania Chapter of the AFA was C. O. Bartlett, vice president of C. O. Bartlett & Snow Co., Cleveland, who spoke on "Modern Ways of Getting Out Castings From the Foundry." Meeting was held at the Moose Club, Erie, Pa.

Mr. Bartlett demonstrated, by the use of slides, that no two foundries can use the same equipment and that each one is an engineering problem in itself. He stated that the installation of modern equipment was always looked to as a means of decreasing costs, but the trend today is that it is a means of retaining help by making the job easier and the foundry a good, clean place in which to work.

Chapter guests included six officials from the Bucyrus-Erie Corp., Milwaukee, among whom was R. C. Woodward, vice chairman, Wisconsin Chapter of the AFA.

Northwestern Pennsylvania Chapter staged one of its regional meetings at Dunkirk, N. Y., Nov. 14, with 147 in attendance. L. P. Robinson, sales manager, Werner G. Smith Co., Cleveland, spoke interestingly and

entertainingly about corerooms and chicken farms. J. Marcus Morrison, U. S. Radiator Corp., Dunkirk, served as chairman of the meeting.

The chapter, in conjunction with the U. S. Employment Bureau at Erie, is embarking on another program this year as a follow up to its successful old timers night of last year.

The chapter will meet Jan. 9 in Sharon, Pa., for the first time. Wilson P. Burns, National Malleable & Steel Castings Co., and Douglas James, Cooper-Bessemer Corp., will be co-chairmen of the meeting. G. P. Halliwell, H. Kramer & Co., is scheduled to speak at the Jan. 26 meeting at the Moose Club, Erie.—*Earl M. Strick, Erie Malleable Iron Co.*

Toledo

APPROXIMATELY 75 members and guests of the Toledo Chapter of the AFA attended the group's annual National Officers' Night meeting at the Toledo Yacht Club, Nov. 19. E. E. Thompson, Unitcast Corp., chapter vice chairman, presided in the absence of Chairman G. R. Rusk, Freeman Supply Co. Victor E. Zang, Unitcast Corp., served as technical chairman.

Guest speakers from the national association were Vice President W. B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., and W. W. Maloney, national secretary-treasurer. They discussed briefly various activities of the association. Another guest speaker, Prof. Douglas Williams, Ohio State University, commented on the enlarged course in foundry engineering training planned for the Columbus, O., school.

Principal speaker of the evening was R. E. Fisher Jr., Bonney-Floyd Co., Columbus, who described his experiences during a recent visit to Europe during which he worked in and inspected foundries in a number of countries there.—*William G. Gude.*

Cleveland

CLEVELAND Chapter of the Nonferrous Founders' Society met at the Athletic Club, Cleveland, Nov. 24, with E. L. Frantz, Apex Electrical Mfg. Co., Cleveland, and chairman of the chapter, presiding.

E. J. Metzger, Wellman Bronze & Aluminum Co., Cleveland, secretary of the chapter, suggested that the Cleveland group follow a program initiated in Boston by having a series of conferences led by a qualified instructor on foundry costs. The program would follow the outlines of the cost system which has been developed by the Nonferrous Founders' Society, and would instruct in the inauguration and use of this system. A questionnaire is being circulated to determine the response to such a program.

W. A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland, and president of the Nonferrous Founders' Society, reported on the recent meeting of the national directors in Chicago. Mr. Gluntz spoke on the purposes of the society in sponsoring cost programs, labor relations programs and other activities. He stressed the importance of returning questionnaires promptly to the national office in order to facilitate and correct information for the benefit of all members.

Frank G. Steinebach, editor of THE FOUNDRY, stressed the need of the Nonferrous Founders' Society by the nonferrous foundry industry. He indicated that all foundrymen constantly should question themselves as to whether or not they are doing the best job possible under the circumstances. In order to do the best job possible, each company should take advantage of the assistance which can be offered by the national society.

Chester Nikodym, Associated Industries of Cleveland, discussed the Taft-Hartley Labor Law and its effect upon industry.—*E. J. Metzger, Wellman Bronze & Aluminum Co.*

New England

REGULAR monthly meeting of the New England Foundrymen's Association was held Nov. 12 at the Engineer's Club, Boston. Prof. Ben A. Lindberg, Harvard Business School, Cambridge, Mass., spoke on "Personnel Selection."

Professor Lindberg pointed out many important factors which are involved in choosing men for supervisory positions as well as different types of jobs. He said a great deal of help could be obtained in selecting the individual for the job by questioning him. In other words, such questions bring out the applicant's interest, ability, aptitude and attitude. These four characteristics are most important in helping to get the right person for the right job.

The attitude and interest of a person are the outcome of his education and environment, whereas his ability and aptitude are inherited characteristics. The two latter attributes can be less readily altered than the two former.

He pointed out that the behavior of an individual varies as the individual and his environment, and that behavior also depends somewhat on time—the same person would behave differently on the day before the Pearl Harbor attack than he would on the day after.—*Merton A. Hosmer, Hunt-Spiller Mfg. Corp.*

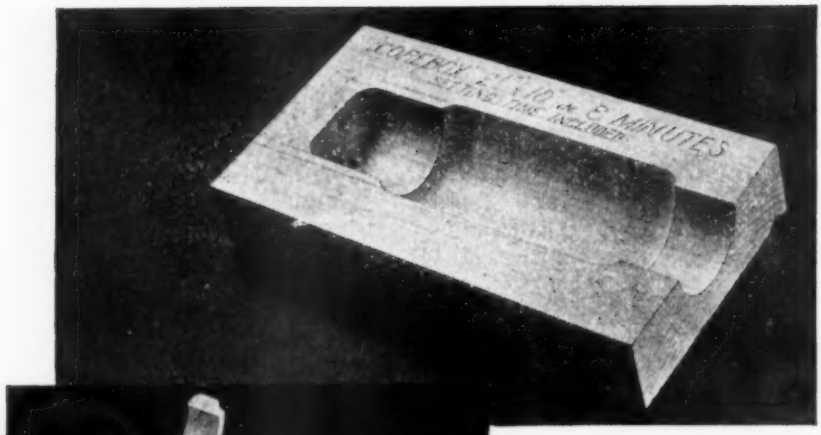
Cincinnati

MEETING at the Engineering Society Headquarters, Cincinnati, Nov. 10, 114 members and guests of the Cincinnati District Chapter of the AFA heard Vincent J. Sedlon, president, Master Pattern Co., Cleveland, talk on "Selecting Pattern Equipment."

Mr. Sedlon stated that the purchaser of pattern equipment should specify production requirements and pattern accuracy limits. He pointed out the necessity of knowing the number of castings required in order to furnish the producer with the best pattern equipment for doing the best overall job, for the least cost. According to Mr. Sedlon, the breakdown on pattern equipment generally should be as follows: For up to 20 castings a soft wood pattern is satisfactory, for up to 200 castings a hard wood pattern would suffice, and for over 200 castings a metal pattern should be used.

He went on to say that all manu-

CINCINNATI DISTRICT Chapter of the AFA entertained as its guests Prof. Douglas Williams, Industrial Engineering Department, Ohio State University, and the Ohio State student chapter of the AFA at the chapter's regular monthly dinner meeting Nov. 10. Members of the student chapter are shown with Professor Williams at the extreme left



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← IN 90 MINUTES WITH

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The most revolutionary development in woodworking since the lathe!

In 90-minute box above, seat for loose ring was milled in 42 seconds. Outside of ring was formed on lathe and milled in place by Miller-Wellman Core Box Machine. Also note pads, bosses, recesses, flutes, step diameters, straight sides, ribs with draft. All fillets were formed of solid material from one piece box. The times given per core box include set-up and cutting to accurate dimension to produce a finished box (no hand work required). How many days (or weeks) would these jobs take by conventional methods?

Seldom do boxes require all the operations listed—but all are easily done with this machine—eliminating hours of time, hundreds of dollars in costs over a few weeks' period.

Write for further details and price of this remarkable core box machine. Ask for Bulletin 44-F.

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TOOLS and EQUIPMENT

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facturers of pattern equipment should explain in detail the type of equipment they propose to furnish so that the purchaser can compare equipment and price with a competitor's proposal.

Prof. Douglas Williams, industrial engineering department, Ohio State University, and the Ohio State student chapter of the AFA were guests of the Cincinnati District Chapter for dinner and the regular meeting. Their trip also included a visit to

VINCENT J. SEDLON

the Lunkenheimer Co. and the Cincinnati Milling Machine Co.—*C. H. Fredricks, Cincinnati Milling Machine Co.*

Northeastern Ohio

NOVEMBER 13 meeting of the Northeastern Ohio Chapter of the AFA at the Cleveland Club, Cleveland, featured round-table discussions by the gray iron, nonferrous, and malleable and steel groups, and a speaker followed by a discussion period at the patternmaking session.

Before the general dinner meeting broke up into discussion groups, Jim Dudley, sports announcer for radio station WJW, Cleveland, gave a short coffee talk.

At the patternmakers' session, O. L. Ducharme, Kindt-Collins Co., Cleveland, spoke before a group of about 65 members and guests on the subject, "Pattern Shop Cost Accounting." Vincent J. Sedlon, Master Pattern Co., Cleveland, was chairman of the meeting.

Mr. Ducharme stated that the economic success and the ability to quote accurate prices with no guessing depend on a complete and thorough knowledge of costs. An incomplete financial statement leads to muddled thinking and muddled actions on the part of management, and further-

(*Continued on page* 160)

More grinding . . . done faster! That's the story of Simonds Abrasive high speed resinoid bonded grinding wheels . . . especially efficient for rough snagging work in foundries and steel mills where fast stock removal at reasonable cost is the prime consideration.

Also used for high speed abrasive cutting-off operations and many precision finishing jobs such as roll grinding, saw gumming, disc grinding and surfacing with segments.

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It's Faster... More Versatile

GRIND ONE CORE... *at the same time* LOAD ANOTHER

Model No. 71

The New Milwaukee Core Grinder handles a wide range of large cores, intricate or cumbersome. Equipped with dual grinding tables, this new machine enables the foundryman to load one core while grinding another core and leaves open head room for hoist lift. The husky, adjustable wheel arm swings progressively around a complete 360° circle to accommodate existing core handling systems at either one of the two grinding positions. Speeds up job. Increases foundry efficiency. For continuous core grinding operations, the balanced wheel arm may be securely locked into place. The column, grinding wheel and drive shaft are mounted on liberal sized, dust-proof, precision ball bearings. Construction throughout is simple and rugged, to insure smooth, vibrationless performance. No. 70 Core Grinder with rotating table for smaller cores, also available. Write for literature.

- 42" Grinding Wheel
- Simultaneous Loading and Grinding
- Vibrationless Performance
- Vertical Adjustable Wheel Arm and Wheel Guard
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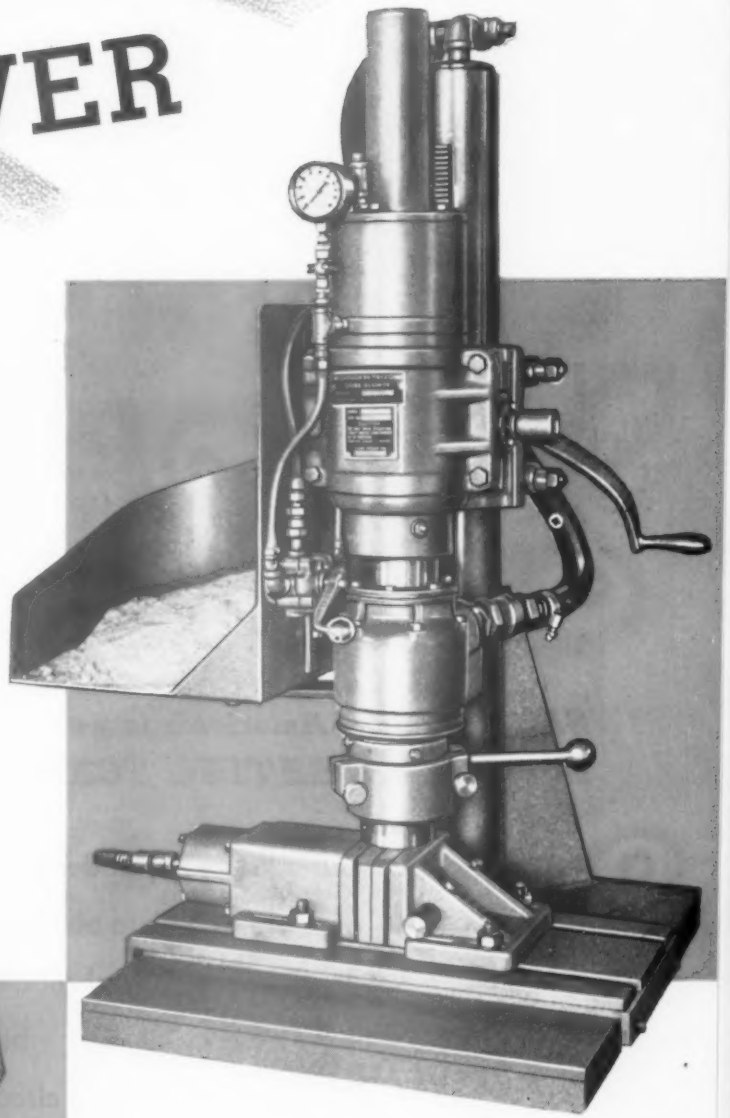
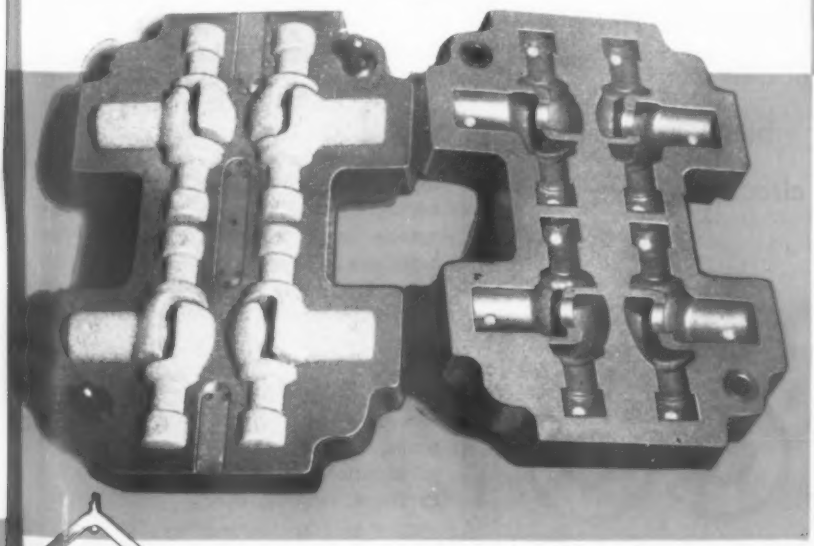
You can blow more intricate cores and blow 'em faster with a Milwaukee-Taccone Bench Type Core Blower. An even, quick blast of air readily blows the most difficult cores. A pressure cylinder steps up the line pressure from 90 lbs. to 120 lbs. blowing pressure and assures steady pressure to produce quality cores. The powerful pneumatic vise and neoprene bonded plate provide a tight, fast blow.

The effortless operation of the quick opening valve and the explosion type blow enable the operator to blow cores as fast as they can be placed into position and removed. The synchronized action of clamping and blowing the core simultaneously, provides greater speed and a high degree of efficiency. Once the core is blown it is automatically released for removal by the operator.





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The Milwaukee-Taccone Core Blower will blow either horizontal or vertical split cores. It blows cores up to 3 lbs. in size. The moderate purchase price and low maintenance cost make it a desirable machine for foundries of all sizes.

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(*Continued from page* 156)

more it puts the patternshop accountant in a bad light, he added.

Four factors which Mr. Ducharme listed as important in figuring costs are: Material costs, direct labor costs, factory overhead, and selling and administrative expenses. In calculating prices, two additional factors must be considered also. They are production delay times and the percentage of efficiency existing in the plant.

With Arthur Tumpach, Ferro Machine & Foundry Co., in the chair, and with Edwin J. Lally Jr., Forest City Foundries Co., leading the discussion, the entire gray iron session was devoted to cupola operation and maintenance. Commencing with the proper method of chipping the lining after a heat, Mr. Lally described several types of patching materials and the method of application. For an improved type spout he instanced a U-shaped tile now available, easily installed and superior in every way to the usual brick and mud lined spout.

He then continued with a description of the sand bed and cited several methods for lighting the bed coke. Personally he favored the use of a gas torch inserted at four points through shell and lining at the level of the sand bed. Pieces of 4-in., pipe laid on the sand bed and pulled out after the coke is placed, are pulled out through the four openings, to leave small tunnels under the coke for penetration of the gas flames. The holes, of course, are plugged after the coke is ignited.

About 40 members attended the session devoted to a discussion of sand defects in malleable and steel castings. Chairman of the meeting was T. D. West, West Steel Casting Co., and J. E. Dvorak, Eberhard Mfg. Co. Division, Eastern Malleable Iron Co., was discussion leader. Beginning with blows, Mr. Dvorak pointed out that they are caused by sand being too fine, moisture too high, and improper venting. Remedies are to increase grain size of sand, reduce moisture content, and improve venting. In the case of drops, usually caused by low green strength or low mold hardness, the remedies are to increase bond or ram harder. Other sand defects with their causes and remedies were discussed, including scabs, buckles and rat tails, metal penetration, cuts and washes, rough surfaces, veining, etc.

Gas and inclusions was the topic at the meeting of the nonferrous group under the direction of Walter Sicha, Aluminum Co. of America,

(*Continued on page* 162)

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Added to a core mix, Truscor and Amerikor give a better surface finish . . . more accurate handling of detail.

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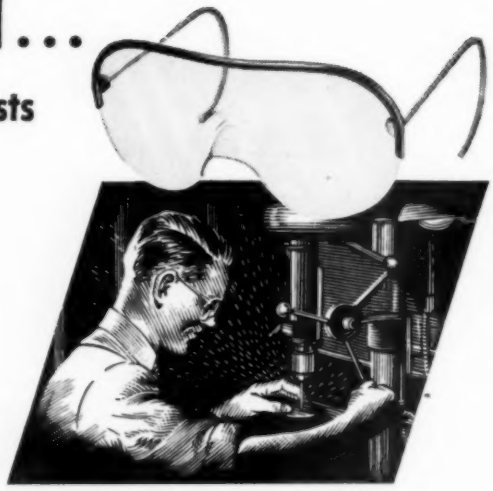

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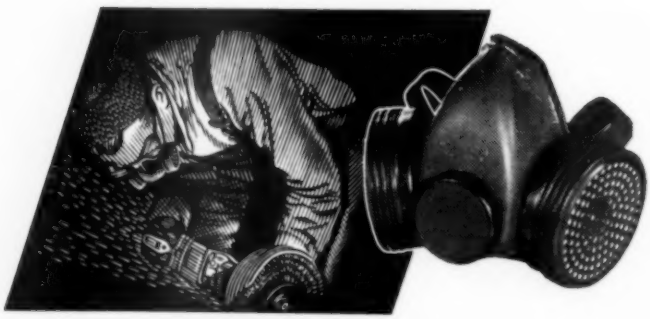

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(*Continued from page* 160)

and Edward J. Vargo, Wellman Bronze & Aluminum Co. Over 30 members were present and a lively period ensued. Consensus was that the principal source of gas in aluminum alloys is in the melting operation, and every precaution should be exerted to hold it to a minimum. Raw material such as ingot and scrap should be dry before being placed in the melting unit. Furnace atmosphere should be such that no unburnt gases are present, and the melting temperature should be maintained as low as possible. Metal should be removed as soon as it reaches the pouring temperature.

Chicago

A ROUNDTABLE type program was conducted by the Chicago Chapter, AFA, Dec. 1, for the third in its series of meetings for the 1947-48 season. More than 175 attended the dinner meeting which was held at the customary place in the quarters of the Chicago Bar Association.

Fred B. Skeates, foundry superintendent, Link-Belt Co., and president of the chapter, presided at the general portion of the meeting. Three of the roundtables were sponsored by the Malleable, Nonferrous and Steel divisions, respectively, while the fourth was arranged jointly by the Gray Iron and Pattern divisions.

The Malleable roundtable was devoted to the subject, "Cupola Malleable Production," with H. W. Maack, chief chemist and metallurgist, Crane Co., Chicago, as the speaker. Cecil F. Semrau, metallurgist, Illinois Malleable Iron Co., Chicago, was chairman.

"Cost Control in the Nonferrous Foundry" was the topic for the Nonferrous division, with James W. Wolfe, secretary-treasurer, Non-Ferrous Founders' Society, Chicago, and an expert in this field, as principal speaker. Chairman was Martin G. Dietl, nonferrous metallurgist, Crane Co., Chicago.

J. Edwin Johnson, general superintendent, Continental Foundry & Machine Co., East Chicago, Ind., addressed the Steel division roundtable on "Quality Control." Serving as chairman was A. W. Gregg, executive engineer, Equipment Division, Whiting Corp., Harvey, Ill.

The roundtable sponsored jointly by the Gray Iron and Pattern divisions was truly a group discussion, no speaker being scheduled. Eugene W. Smith, salesman, Western Mate-

(*Continued on page* 164)

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that means Better Service and Definite Savings for You!

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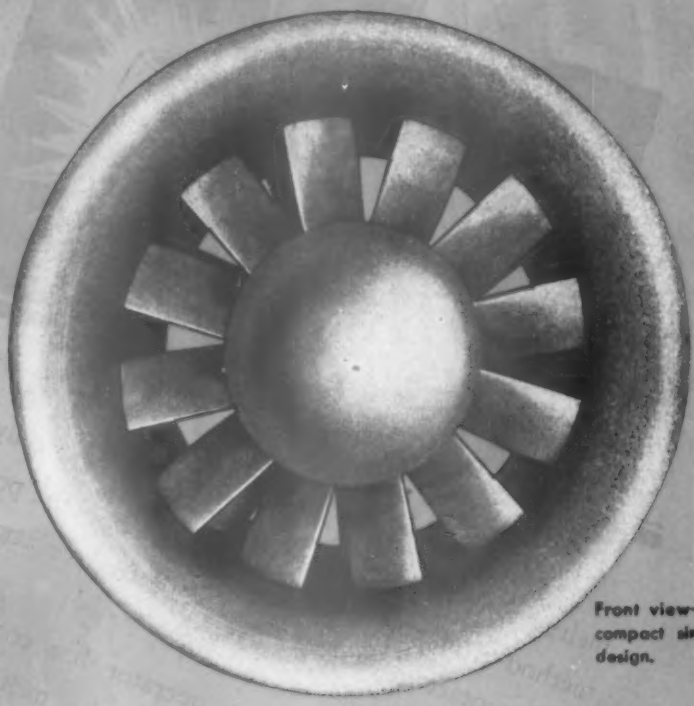

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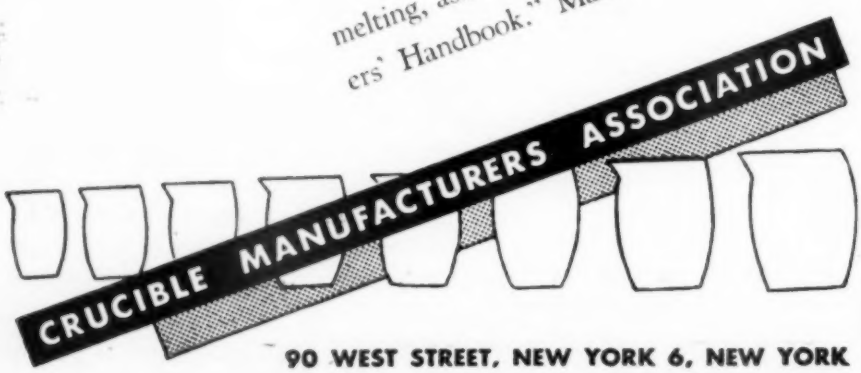
High yield of good castings requires proper melting equipment. Crucible melting is the only method of non-ferrous melting which limits the possible contact of molten metal with furnace atmosphere.

The crucible furnace operator has complete control of exposure of the metal during melting. Direct transmission of heat to metal means direct contact of furnace gases with the metal. Avoid this condition with crucible furnaces.

For practical suggestions on melting, ask for "Crucible Melters' Handbook." Mailed free.



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(*Continued from page* 162)

rials Co., Chicago, officiated as chairman.

E. Claude Jeter, foundry metallurgist, Ford Motor Co., Dearborn, Mich., will be the speaker for the chapter's Jan. 5 meeting, and will deal with the production of automotive castings.—*Erle F. Ross.*

Detroit

JESS TOTH, secretary, Harry W. Dietert Co., has been appointed chairman of the educational committee of the Detroit Chapter of the AFA.

Included on the committee are: William Seese, J. S. McCormick Co.; William Morgan, E. F. Houghton Co.; Robert Gardner, Ford Motor Co.; Crary Davis, Aluminum Co. of America; E. H. Stilwell, Dodge Division, Chrysler Corp. and R. C. Harrell, Wilson Foundry & Machine Co.

Tentative plans of the committee call for a three-part program: A series of lectures, centered around public speaking, and public relations are planned for foundry personnel. A separate "short course" will be offered to acquaint Detroit high school students with the opportunities offered by the foundry industry. The educational program will end late this winter with a contest for patternmaking apprentices.—*Charles J. Rittinger, American Car & Foundry Co.*

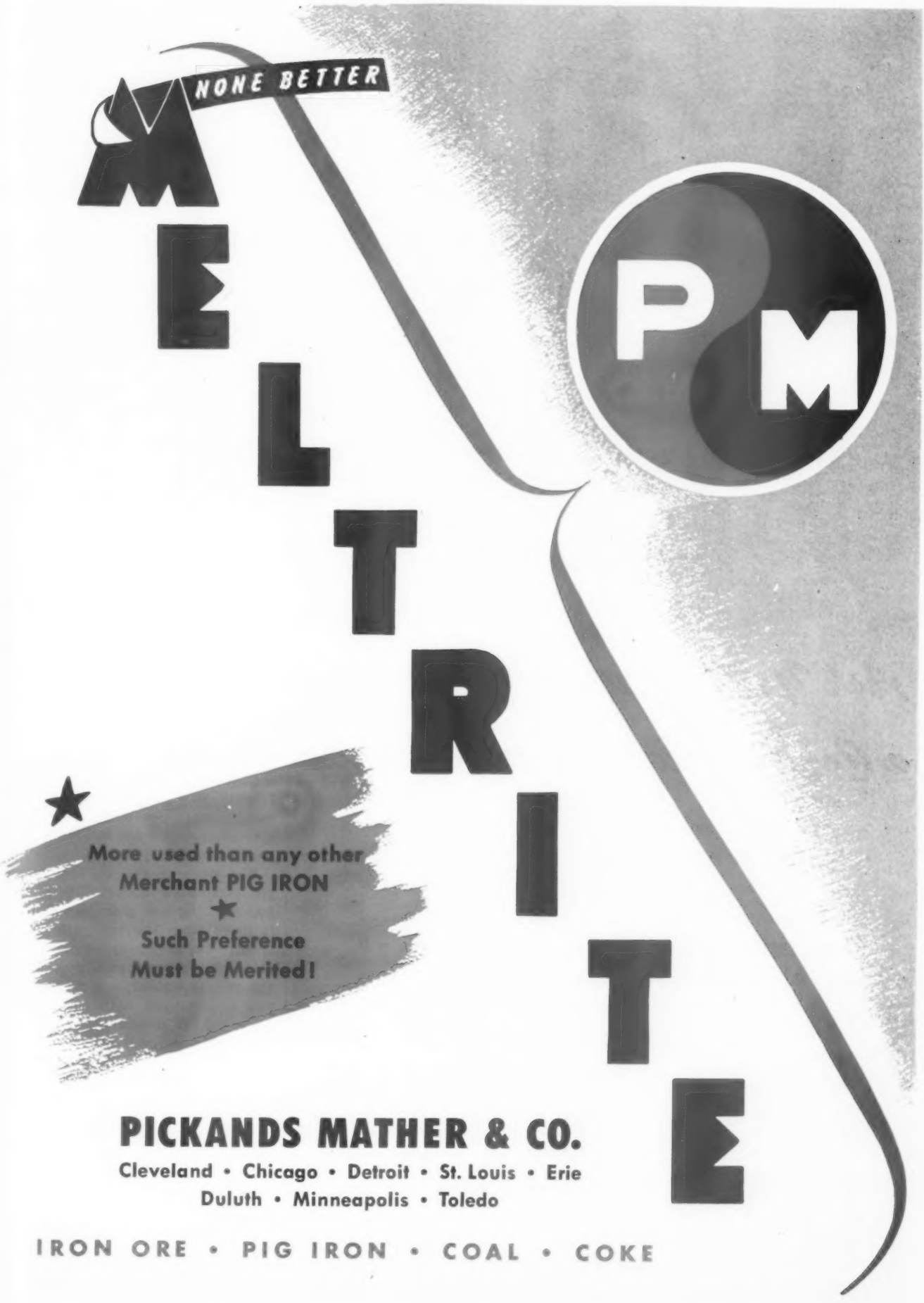
Pittsburgh

SINCE there is dim prospect of immediate relief from the present unfavorable market conditions of raw materials and difficult personnel problems, cupolas and auxiliary equipment should be given most thorough consideration, W. R. Jaeschke, Whiting Corp., Harvey, Ill., told members of the Pittsburgh Foundrymen Association at their monthly meeting, Nov. 17.

While the cupola in general has not changed basically in design, manufacturers have given more attention to operating, he stated. For good operation with a minimum of bridging, tuyeres should be set so that the top of the slag blanket never rises closer than 4 in. and preferably 6 in. of the tuyeres. Less bridging, hotter and faster melting results are reported by some interests through use of two rows of tuyeres.

If the height of the charged column in the cupola is too low, much sensible heat may be lost and coke consumption will be high, Mr. Jaeschke said. If the column is too

(*Continued on page* 166)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COMBS GYRATORY FOUNDRY RIDDLES

(*Continued from page* 164)

high, resistance to the blast may be too high and damage to the coke bed by the high drop of the charge may be severe. Low penetration of the blast and high coke consumption also result from this condition. Generally speaking, the distance from the cupola bottom plate to the top of the charged column may be as low as 15 ft for a small 21-in. cupola to as high as 19 ft 6 in. for a cupola as large as 90 in. ID.

Use of a hot blast cupola has gained in favor under present operating conditions. It promotes hotter melting with less coke, and increased production as coke consumption is reduced. With preheated blast, ignition of coke is more rapid, thereby reducing the chilling and oxidizing zones immediately in front of the tuyeres. Oxidation and bridging is minimized and consumption of pig iron can be appreciably reduced.

Dry blast equipment is slowly taking hold in the foundry industry, he stated. It has been accepted for some time as a necessity in such branches as the piston ring foundries. If closer analyses of scrap losses were studied in relation to weather conditions, acceptance of this equipment would be more general. With dry blast equipment, it is possible to control the moisture in the blast to a uniformly low degree throughout the seasons which should reduce casting losses, fuel costs and increase production. Blowers used may be of the centrifugal or positive displacement type, but should be controlled automatically for greater uniformity in results. Automatic air weight controllers are available that also compensate for air temperature and barometric pressure.

Wet slagging systems may be simple perforated buckets in a water pit, catching and granulating slag as it flows from the conventional slag spout. Or, they may be more elaborate quenching chutes down which the slag is sluiced to a pit. The pit can be equipped with a mechanical conveyor for discharge into a portable container or storage pit or hopper. Water may be recirculated by a centrifugal pump from a separate reservoir after slag has been allowed to settle out.

Metallurgical results are largely dependent on the material charged and the manner in which these materials are distributed in the cupola. The distribution in the cupola is largely dependent on type of charging bucket used.

Recently, duplexing equipment has

(*Continued on page* 168)

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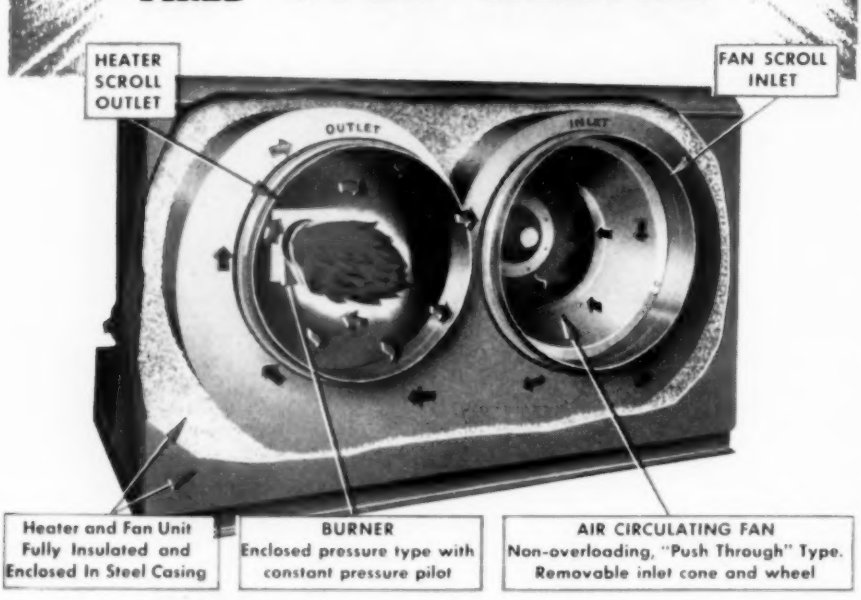
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Due to its compact design, the Scroll-Aire will fit into confined areas that other heating systems will not. This is very important when "rejuvenating" old ovens with inadequate temperature ranges, insufficient capacity or inadequate heat distribution systems. In such cases the Scroll-Aire is easily adapted to ovens of any design and readily fits into the space occupied by the old heating system with room to spare.

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(*Continued from page* 166)

been receiving greater attention. Most operators desire a reasonable reservoir of molten metal to produce greater uniformity in composition and temperature. The usual loss of about 100°F in the standard type of mixing ladle is a luxury most operators can no longer afford. Fired mixing ladles from 3-ton capacity and up to the larger cradle furnaces of 15 to 20 ton capacity are gaining in favor. These units are usually fired with pulverized coal and can overcome heat losses so that the metal can be tapped from them at the same temperature as delivered by the cupola.

About 850 attended the association's annual Christmas party, held Monday evening, Dec. 15, at the William Penn Hotel.—*Joseph C. Sullivan.*

Philadelphia

VARIOUS phases of coremaking in the iron, steel and nonferrous industries were covered in a talk by J. A. Gitzen, Delta Oil Products Co., Milwaukee, at the Nov. 14 meeting of the Philadelphia Chapter of the AFA. The meeting, held at the Engineer's Club, Philadelphia, was attended by a capacity group of about 200 members and guests. E. C. Troy, chapter chairman, presided and Robert Anson, metallurgist, Crucible Steel Casting Co., Lansdowne, Pa., acted as technical chairman.

Mr. Gitzen mentioned particularly various types of core sand binders and also discussed effect of mold atmosphere on casting quality, describing some of the experimental work which has been done on this subject.—*Jack L. Furey, Swan-Finch Oil Corp.*

Eastern New York

AMERICAN Foundrymen's Association has authorized the formation of its 39th chapter, with headquarters at Albany, N. Y. Directors have approved the petition of a group of Albany area foundrymen and representatives of allied industry firms for a local group to serve that area, Vermont and western Massachusetts.

Fifty executives and technologists signed the petition for chapter status at an organizational meeting in Albany Oct. 16. AFA Vice President William B. Wallis, president, of Pittsburgh Lectromelt Furnace Corp.; John M. Robb, Jr., Philadelphia resident manager of Hickman, Williams & Co., a national director, and S. C.

(*Concluded on page* 170)

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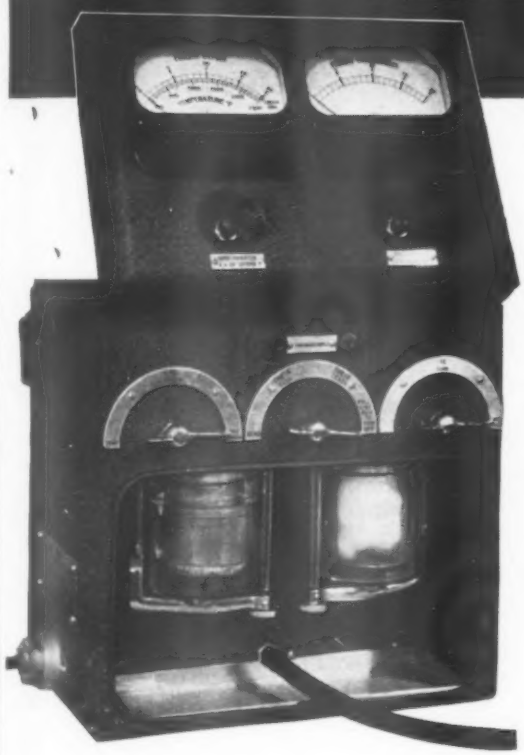

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(*Concluded from page* 168)

Massari, AFA technical director were guests and featured speakers at the gatherings. At an earlier "chapter expectancy" meeting in September, AFA Director, Horace A. Deane, vice president of the Brake Shoe and Castings Division of American Brake Shoe Co., New York, met with the group.

The new chapter will be known as the Eastern New York chapter. It is the fifth AFA group in the Empire State; others include Metropolitan, Rochester, and Central and Western New York, with headquarters at Syracuse and Buffalo, respectively.

Charles E. Killmer Jr., Albany representative of Swan-Finch Oil Corp., has been elected the first chairman of Eastern New York chapter; Alexander Andrew, foreman with American Locomotive Co., Schenectady, vice chairman, and John A. Wettergreen, assistant foundry superintendent with General Electric Co., Schenectady, secretary-treasurer.

Central Michigan

AT THE Nov. 25 meeting of the Central Michigan Chapter of the AFA,, held at the Columbia Hotel, Kalamazoo, Dr. George P. Halliwell, director of research, H. Kramer & Co., Chicago, headed the technical program, with an illustrated lecture on "Nonferrous Foundry Practice."

Dr. Halliwell confined his description largely to aluminum bronze and manganese bronze alloys. The phase diagram and micro-constituents of these alloys were covered in detail with the aid of carefully prepared slides. From these studies the speaker was able to point out clearly that these alloys are very sensitive to minor changes in composition and that to get the desired properties great care must be taken in selection and melting of the metals.

In covering practical suggestions for efficient handling of these alloys, Dr. Halliwell first advised that low pouring temperatures should be maintained. A pouring temperature just sufficient to run the casting was recommended. His second important consideration was in regard to the gating practice, and he advised that gates should be arranged to direct the metal into the mold as quickly as possible. He pointed out that dropping the metal in the mold or otherwise breaking the surface of the molten metal causes many casting rejects in aluminum bronze and manganese bronze foundry practice. —*C. C. Sigerfoos, Michigan State College.*

ALUMINUM ALLOY CASTINGS

(*Continued from page 98*)

inum's resistance to atmospheric corrosion. When the monument was being completed in 1884, a 100-ounce pyramidal casting costing $225 was placed on top of the capstone. At that time it was the largest aluminum casting ever produced. When the monument was cleaned a half century later, the casting was examined by metallurgists from the National Bureau of Standards who found that it had been substantially unaffected by its 50 years of weathering.

General-Purpose Alloys — Alloys containing copper and silicon, either singly or together, or in combination with smaller amounts of other elements, comprise the groups that are most widely used for the great bulk of aluminum casting production. In addition, these alloys cover a wide range of mechanical properties, so that they are useful as well for some of the more specialized purposes.

The binary alloy containing 8 per cent copper was the earliest sand casting aluminum alloy. Known generally as No. 12 alloy, it was widely used for many years. About 1920 the aluminum-silicon alloys gradually came into use, followed by the development of the aluminum-copper-silicon alloys. Today alloy No. 12 has been greatly replaced by the aluminum-copper-silicon alloys.

Typical of the aluminum alloys containing copper or silicon, or both, in general use today are sand casting alloy C1, permanent-mold alloy CS4, and alloys CS22 and SC8 for both methods of casting. Sand casting alloy ZG41 is particularly useful where heat treating facilities are not available, as it attains desirable properties by simply aging at room temperature.

Alloy SC8 is one of the most useful of all the general-purpose alloys. Its excellent properties in both the as-cast and heat-treated conditions enable it to substitute for a number of the older alloys and thus reduce the number of alloys the foundryman must stock.

The 4 per cent copper alloys C1 and CS4 are greatly benefited by heat treatment and when so treated have an excellent combination of mechanical properties. These alloys may be heat treated in various ways to effect different combinations of ductility and strength, as shown in Table V.

The aluminum-copper-silicon alloys, such as SC1 and SC8, have better casting characteristics than the aluminum-copper alloys, but are not as resistant to corrosion as the aluminum-silicon series. The copper content provides strength and hardness while the silicon content improves the casting qualities and increases the resistance to corrosion. These alloys are particularly well adapted to casting work involving intricate design having extremely large differences in section thicknesses and requiring pressure tightness. They are heat treatable.

Even better casting characteristics are found in the aluminum-silicon alloys, such as S1 and S2, together with higher resistance to corrosion. These alloys have a greater tendency to absorb iron than do aluminum-copper alloys. Because of the harmful effect of iron on the mechanical properties of the cast alloy, contamination must be held to a minimum. Although the machining of these alloys is more difficult than of many other aluminum alloys, the problem is simplified by proper technique, tools and lubricants.

Pressure tightness, strength, corrosion resistance, and castability in particularly desirable combinations are the outstanding attributes of aluminum-silicon-magnesium alloys SG1 and SC21 (which also contain copper). When heat treated, they have tensile properties comparable with those of the 4 per cent copper alloys C1 and CS4. They are outstanding for all types of service re-

TABLE V—Mechanical Properties of Aluminum Casting Alloys (Typical Values)

	Condition*					Tension[1]			Compression[4]	Hardness[1]	Shear	Fatigue
Alloy	As Cast	Annealed	Artificially Aged	Solution Heat Treated	Solution Treated and Aged	Yield Strength[2] (Set—0.2%), psi	Ultimate Strength, psi	Elongation, Per Cent in 2 in.	Yield Strength[2] (Set—0.2%), psi	Brinell, 500-kg Load, 10-mm ball	Shearing Strength, psi	Endurance Limit[3], psi
C1				S		16,000	32,000	8.5	16,000	60	24,000	6,000
C1					S	30,000	40,000	2.0	38,000	95	31,000	7,000
CG1		S				20,000	27,000	1.0	20,000	80	21,000	9,500
CG1					S	30,000	40,000	0.5	43,000	115	29,000	8,500
CG1			P			35,000	37,000	0.5	40,000	115	27,000	8,500
CG1					P	36,000	48,000	0.5	36,000	140	30,000	9,000
CN21		S				18,000	27,000	1.0	18,000	70	21,000	6,500
CN21					S	25,000	28,000	2.0		75	24,000	9,500
CN21			P			34,000	40,000	1.0	34,000	105	26,000	10,500
CN21					P	42,000	47,000	0.5	46,000	110	31,000	9,500
CS4				P		22,000	37,000	9.0	22,000	75	30,000	9,500
CS4					P	26,000	40,000	5.0	26,000	90	32,000	10,000
CS4					P	20,000	39,000	4.5	20,000	80		
CS21	P					24,000	32,000	1.5	32,000	100	22,000	
CS22	S					15,000	24,000	1.5	17,000	70	20,000	9,000
CS22	P					19,000	28,000	2.0	19,000	70	23,000	
CS23			P			16,000	29,000	1.0	16,000	95	22,000	
G1	S			S		25,000	46,000	14.0	26,000	75	33,000	7,000
GS1	S					13,000	20,000	2.0	15,000	50	17,000	
GZ1	P					16,000	27,000	7.0	17,000	60	22,000	
S1	S					9,000	19,000	6.0	10,000	40	14,000	6,500
S2	S					9,000	19,000	6.0	10,000	40	14,000	6,500
S1	P					9,000	24,000	9.0	9,000	45	18,000	
S2	P					9,000	24,000	9.0	9,000	45	18,000	
SC1	P					16,000	28,000	2.0	16,000	70	25,000	
SC8	S					18,000	27,000	2.0	18,000	70		10,000
SC8					S	24,000	36,000	2.0	24,000	80		10,000
SC8	P					19,000	34,000	2.5	19,000	85	24,000	
SC8					P	27,000	40,000	3.0	27,000	95		
SC21			S			23,000	28,000	1.5	24,000	65	22,000	7,000
SC21					S	25,000	35,000	2.5	29,000	80	30,000	8,500
SC21					S	29,000	35,000	1.5		75		10,000
SC21					P	27,000	43,000	4.0	27,000	90	30,000	9,000
SC41					P	50,000	55,000	0.8		101	36,000	
SC41			P			26,000	38,000	1.0		95		
SC41					P	25,000	43,000	3.0		85		
SC41			S			22,000	27,000	5.0		90		
SC42					S	37,000	42,000	1.5	22,000	70	21,000	10,000
SC42					P	40,000	49,000	3.0		97		
SG1			S			20,000	25,000	2.0	22,000	60	18,000	7,500
SG1					S	24,000	33,000	4.0	24,000	70	27,000	8,000
SG1					P	27,000	40,000	5.0	24,000	90		
SN41			P			28,000	36,000	0.5	28,000	105	24,000	
SN41					P	43,000	47,000	0.5	43,000	125	27,000	
ZG41			S†			25,000	35,000	5.0	17,000	75	26,000	9,000

* In these columns *S* denotes specimen cast in green sand; *P* denotes chill-cast specimen having properties similar to a permanent or semipermanent-mold casting.

† May be aged at room temperature, or artificially aged at higher temperature.

1. Tension and hardness values determined from standard half-inch diameter specimens individually cast in sand (S) and permanent (P) molds, and tested without machining off the surface.
2. Yield strength is the stress which produces a permanent set of 0.2 per cent of the initial gage length (ASTM Standard Methods of Tension Testing—E8-46).
3. Endurance limits are based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type of machine and specimen.
4. Compression tests made on specimens having an l/r ratio of 12.

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quiring high-quality castings, especially those of intricate design.

Although the aluminum-magnesium alloys are especially noted for their corrosion resistance, one alloy, G3, has the highest mechanical properties of any of the aluminum sand casting alloys. The alloy is difficult to cast, however, and unless special foundry practices are applied in handling it, these extreme mechanical properties may not be realized in the completed castings.

Aluminum-zinc alloys occupy a position in England similar to that of aluminum-copper alloys in the United States, but they have not found very wide use here. Alloy ZG41 provides a combination of mechanical properties intermediate between those of the non-heat-treated aluminum-copper and aluminum-silicon alloys, and the heat treated alloys. Alloys of this type age harden rapidly at room temperature and show greater loss of strength at elevated temperatures than do other alloys.

Architectural and Decorative Alloys—Resistance to atmospheric corrosion and exceptional castability are the two prime requisites for alloys to be suitable for architectural and decorative purposes. The aluminum-silison and aluminum-magnesium alloys stand highest on the list in corrosion resistance, and the aluminum-silicon series has excellent casting characteristics which enable them to reproduce faithfully fine design details. The aluminum-magnesium series has higher resistance to corrosion than the aluminum-silicon alloys but the casting qualities are not as good. Both types are well adapted to surface finishing of various kinds, particularly the electrolytically produced oxide finish. Details of surface finishing of these and other aluminum alloys will be covered in a separate article.

For the majority of architectural uses, including spandrels, plaques, name plates, doors and ornamental work in general, alloy S1 is excellent. Alloys G1, GS1, and GZ1 also are used extensively, especially where the finish must match the finish of adjacent parts fabricated from some of the wrought aluminum alloys. Where higher strength is required, the heat treated aluminum-silicon-magnesium alloy SG1 is used.

Corrosion-Resistant Alloys — As stated previously, the aluminum-silicon and aluminum-magnesium alloys have the highest resistance to corrosion of any of the aluminum alloys. Other alloys, however, have better resistance to certain types of exposure.

(*Continued on page* 174)

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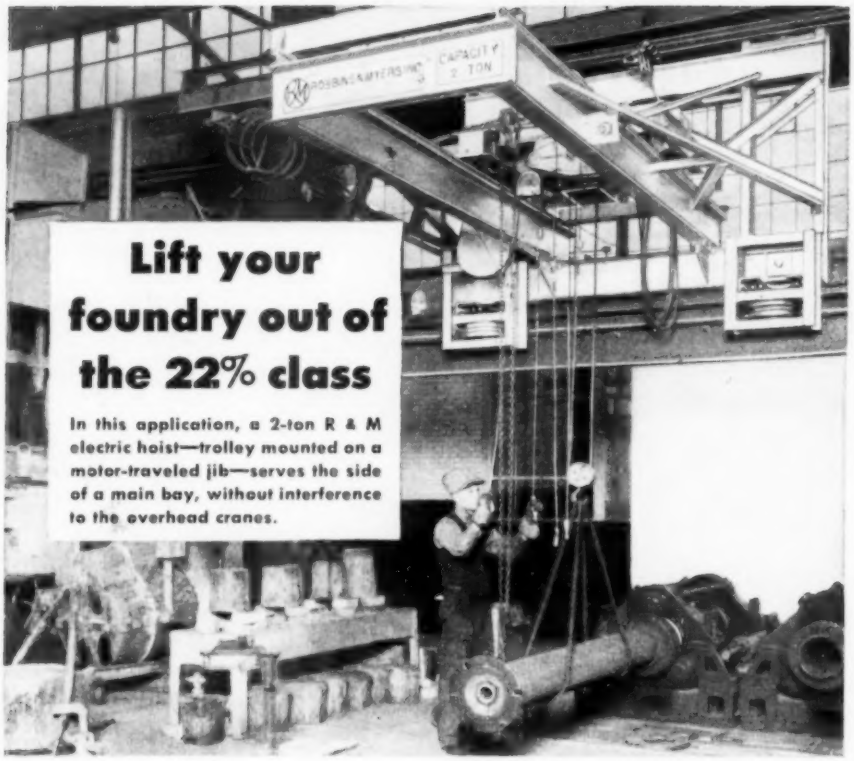
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22% of the average payroll goes into materials handling, according to a recent survey (Foundry, March, 1947). But many plants are making substantial savings by *speeding operations* with Robbins & Myers electric hoists. These powerful, time-saving labor-aids *step up* materials movement . . . *boost* output per man-hour . . . *cut production costs.*

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(*Continued from page* 172)

The aluminum-silicon series, notably alloy S1, are widely used in marine work because of their excellent resistance to salt water and salt-laden atmospheres. Although the aluminum-magnesium series is much more corrosion resistant, these alloys are not used so widely because their high solidification shrinkage requires special handling in the foundry. The aluminum-silicon alloys, however, are superior in mildly acid solutions such as those found in the textile industry. Both series, especially alloys S1 and G1, find extensive applications in the food-handling and chemical industries. Where high strength must be combined with high corrosion resistance, alloy SG1 is excellent, providing good pressure tightness and weldability as well.

In severely corrosive environments, oxide surface finishes supplemented by a dichromate impregnation of the oxide film make these alloys even more resistant to attack. Details of these processes will be covered in a subsequent article.

Alloys for Use at Elevated Temperatures — Pistons, cylinder heads and other parts of internal-combustion engines, and sole plates of electric irons are among the applications requiring maintenance of mechanical properties at elevated temperatures. Both heat treatable and non-heat treatable alloys are found among those having this characteristic.

Alloys CG1, CN21, SN41, SC41, SC42 and SC21 all retain in relatively high degree their strength and hardness at temperatures such as those which prevail in internal-combustion engines (see Table VI). All are heat treatable, and choice of both alloy and heat treatment depend on the service conditions.

Alloys CN21, SC41 and SN41 are used mostly for pistons but CN21 is used for cylinder heads of air-cooled engines requiring good retention of mechanical properties up to temperatures of 500-600°F. For crankcases and cylinder heads of liquid-cooled aircraft and diesel engines and similar applications involving temperatures upwards of 400°F, alloy SC21 and SC42 have been found to be espeally suitable. Alloy CS21 develops high hardness in the as-cast condition and retains this property at elevated temperatures. This characteristic makes the alloy particularly adaptable for sole plates of electric hand irons.

Piston Alloys—In addition to retaining their mechanical properties at elevated temperatures, alloys to be suitable for use in pistons of inter-

nal-combustion engines must have good wear resistance, low coefficient of thermal expansion, and good casting qualities. Alloy CG1 has been widely used for this purpose in the past but has been largely replaced by alloys CN21, CS23, and SN21. Alloy CN21, also known as "Y" alloy, has some of the characteristics of the aluminum-magnesium alloys, requiring careful handling in the foundry for best results; it is suitable for both sand and permanent mold castings. Aluminum-copper-silicon alloys of the CS23 type also are used in the permanent mold production of pistons.

Alloy SN41, containing silicon, nickel, magnesium and copper, has come to be used extensively for the production of pistons by either permanent or semipermanent mold methods. SC41 contains Mn instead of Ni. A modification of alloy SN41, known as Alcoa alloy D132, has been recently introduced for piston applications. This alloy has a nominal composition, in per cent, as follows (balance aluminum): Silicon 8.5-10.5; copper 2.0-4.0; magnesium 0.5-1.5; nickel 0.5-1.5. These alloys have the lowest coefficients of thermal expansion of the four and retain their strength well at operating temperatures.

Alloy SC41 under normal conditions should prove to be slightly less expensive. Likewise alloy SC42 is a less expensive alternate for alloys SC21 and SG1. It has somewhat similar characteristics and is used mostly for the parts of internal-combustion engines. It has good casting characteristics and retains its strength well at moderately elevated temperatures.

Bearing Alloys — Except for very limited applications, the use of aluminum-alloys for bearings is of comparatively recent origin. Experimental work initiated before World War II and continued after the war has led to the recent development of three casting alloys for bearings, all intended for permanent mold casting and a variety of heat treatments. These are designated Alcoa alloys 750, XA750, and XB750.

Alloy 750 contains nominally 6.5 per cent tin, 1.0 per cent copper, and 1.0 per cent nickel; XA750 is similar except that silicon is added; XB750 contains higher percentages of copper and nickel with an addition of magnesium. These alloys have high fatigue strength, excellent resistance to corrosion, high thermal conductivity, relatively low hardness, ability to minimize shaft wear, and flexibility. They have been used mostly in heavy duty service such as connecting-rod, main, and thrust bearings, notably in the diesel engine field. Alloy XA750 is intended for higher speeds than 750 and XB750 has been developed for operation at higher temperatures.

Miscellaneous Alloys — Many special-purpose alloys have been developed for applications where specific characteristics are desired. Their usefulness, however, usually is limited to the particular applications for which they are designed.

Typical of these highly specialized alloys is a binary alloy containing 2 per cent manganese which has high resistance to slightly acid solutions and has excellent ductility. It has limited use because of its difficult casting characteristics.

Controlled electrical conductivity is required in some electrical equipment, particularly in the rotor bars of induction motors. In many rotors these bars are cast integral with the collector rings and cooling fans. When maximum conductivity is required, controlled compositions of essentially pure aluminum are used. Where the design permits slightly lower conductivity, the addition of 1.5 per cent silicon materially improves the casting qualities.

Where low electrical conductivity is necessary, an alloy such as Alcoa A254 contains 6 per cent magnesium, 1.5 per cent manganese and 1.5 per cent nickel may be used. Like other aluminum-magnesium alloys it requires similar handling for best results.

Rich Alloys — Foundries may purchase aluminum pig or ingot and compound their own alloys or purchase alloy ingot. For those com-

(*Concluded on page* 178)

TABLE VI. Typical Tensile Properties of Some Aluminum Casting Alloys at Elevated Temperatures (Lowest Strengths During 10,000 Hours at Heating and Testing Temperature)

Alloy and Condition	Temperature Deg F	Strength, psi — Yield	Strength, psi — Tensile	Elongation % in 2 in.
CG1—Sand Cast Annealed	75	20,000	27,000	1.0
	300	17,000	25,000	1.0
	400	14,000	22,000	1.5
	500	11,000	17,000	3.0
	600	4,500	8,000	14.0
CG1—Sand Cast Solution Treated and Aged	75	30,000	40,000	0.5
	300	28,000	35,000	1.0
	400	16,000	24,000	2.0
	500	5,000	10,000	6.0
	600	4,500	8,000	14.0
CG1—Permanent-Mold Cast Aged	75	35,000	37,000	0.5
	300	29,000	33,000	0.5
	400	20,000	26,000	1.0
	500	12,500	18,000	3.0
	600	6,000	10,000	10.0
CN21—Sand Cast Annealed	75	18,000	27,000	1.0
	300	18,000	27,000	1.0
	400	14,000	21,000	1.5
	500	8,000	16,000	3.0
	600	4,000	8,000	9.0
CN21—Permanent-Mold Cast Aged	75	34,000	40,000	1.0
	300	33,000	37,000	1.0
	400	22,000	28,000	2.0
	500	9,000	15,000	10.0
	600	5,000	9,000	30.0
SC21—Sand Cast Solution Treated and Aged	75	25,000	35,000	2.5
	300	25,000	30,000	1.5
	400	9,000	13,000	12.0
	500	5,000	8,000	22.0
	600	3,500	6,000	30.0
SC21—Sand Cast Aged	75	23,000	28,000	1.5
	300	17,000	22,000	2.5
	400	9,000	13,000	12.0
	500	5,000	8,000	22.0
	600	3,500	6,000	30.0
SC21—Permanent-Mold Cast Solution Treated and Aged	75	27,000	43,000	4.0
	300	24,000	32,000	2.0
	400	9,000	12,000	20.0
	500	6,000	8,000	25.0
	600	3,000	4,500	50.0
SG1—Sand Cast Solution Treated and Aged	75	24,000	33,000	4.0
	300	16,000	21,000	5.0
	400	9,000	13,000	8.0
	500	5,500	8,000	20.0
	600	3,000	4,500	45.0
SN41—Permanent-Mold Cast Aged	75	28,000	36,000	0.5
	300	22,000	31,000	1.0
	400	13,500	23,000	2.0
	500	9,500	17,500	2.0
	600	5,000	11,000	8.0
* ZG41—Sand Cast Aged at Room Temperature	325	17,000	20,000	7.0
	400	11,000	13,000	10.5

* After 1000 hours at temperatures indicated.

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Keokuk Steel Casting Co. mulls over 200 tons of molding, facing and core sand a day in their No. 60 Speedmullor. Each batch of hot shake-out sand is quickly cooled to within 10° of room temperature and thoroughly mulled—*all in a 1½ minute cycle!* The Speedmullor is at least 4½ times as fast as any conventional type mixer. Furthermore, it actually mulls, not merely mixes.

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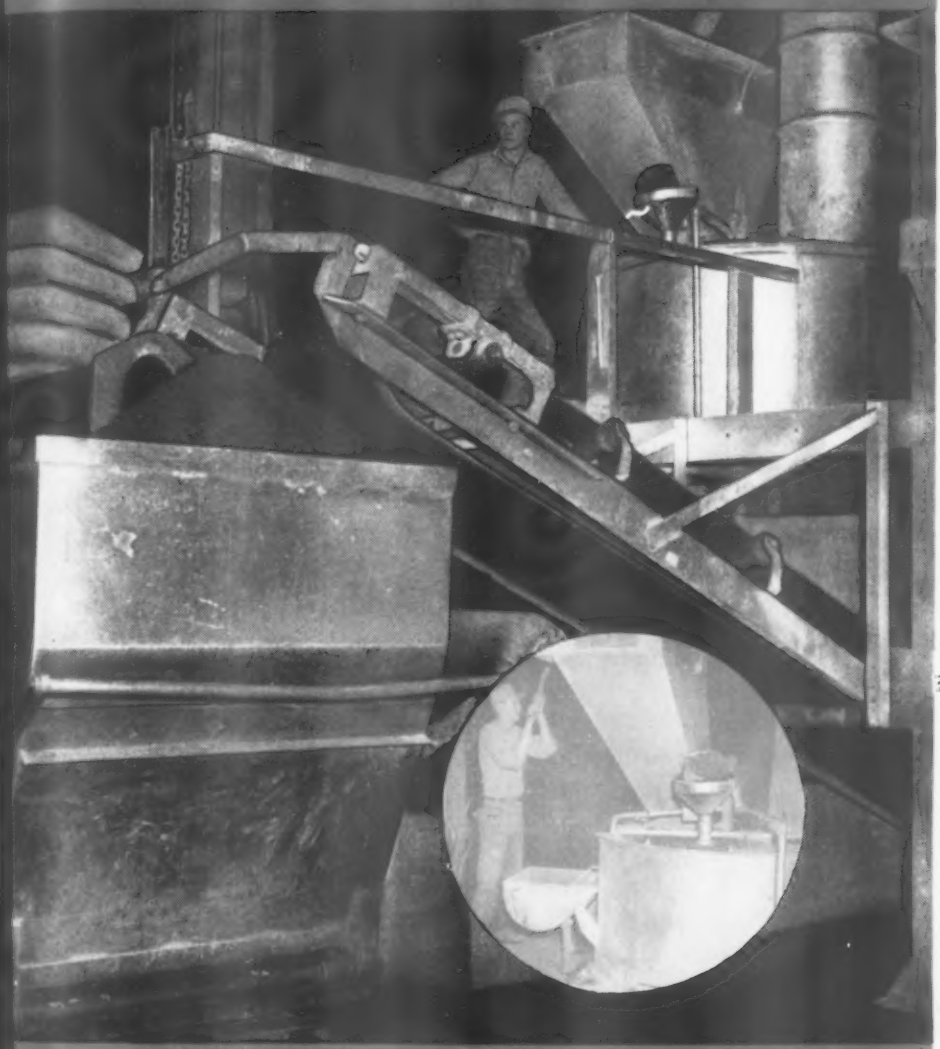
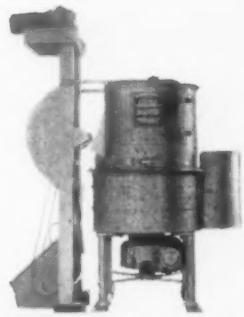
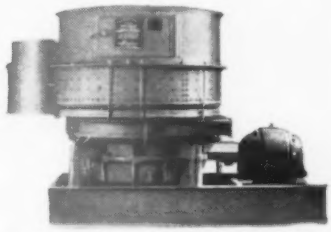
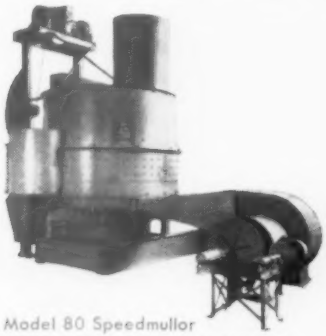




Model 30 Speedmullor with skip hoist for loading. Popular with small and medium sized foundries.



Model 80 Speedmullor handles big mulling jobs with ease.



Model 80 Speedmullor with air cooling and fines removal.

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(*Concluded from page* 175)

pounding their own alloys there are available so-called rich alloys in ingot form, containing large proportions of the desired elements such as 40 per cent copper or 25 per cent nickel. Rich alloy pig also is available in a variety of compositions, such as 10, 12, and 15 per cent silicon; 18 per cent copper; and 5 per cent manganese.

By mixing these rich alloys with the proper amount of aluminum pig or ingot, plus other alloying elements that are easily introduced directly, alloys of any desired composition may be produced. In order to obtain good results consistently, the melting furnaces must be equipped with accurate pyrometric control and the process should be subject to close laboratory check. Foundries not having these facilities would do better to purchase their alloys in ingot form.

In conclusion, foundries and users of sand, permanent mold, and semi-permanent mold castings have today about 40 different alloys and several different heat treatments from which to choose. For every individual use some one of these alloys and heat treatments is better for the purpose than any other. However, there is considerable overlapping of properties, especially among alloys of closely related composition, so that a careful selection of comparatively few alloys will serve a wide variety of purposes. Future articles in this series will cover other aspects of aluminum casting practice—melting and pouring procedures; casting design; sand and permanent-mold practices; trimming, machining, and finishing; heat treatment; inspection and quality control; and end uses.

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Chicago Malleable Castings Co., 1225 W. 120th St., Chicago, suffered a fire in its plant Nov. 29, with loss estimated at $100,000 to $150,000.

OBITUARY

DAVID M. CURRY, who was retired early this year by the Navy with rank of full commander, died suddenly Oct. 27, in Milwaukee. Comdr. Curry was on Naval Ordnance inspection work in the Milwaukee area during the recent war. He spent 11 years as assistant foundry superintendent, Ford Motor Co., Detroit, 7 years as foundry superintendent, Federal-Mogul Corp., Detroit, and was connected with the Development and Research department, International Nickel Co., Detroit, for 5 years. Prior to his Navy service he was on the technical service staff of H. Kramer & Co., Chicago.

• • •

William R. Kelly, 42, since 1939 assistant superintendent of the steel and roll foundry division, Bethlehem Steel Co., Bethlehem, Pa., died Nov. 7. Mr. Kelly, a native of Pittsburgh, was graduated from North Carolina State University and joined Bethlehem Steel in 1930. His father, until his death last year, operated a nonferrous foundry in Grove City, Pa.

• • •

John H. Morrison, 68, vice president in charge of sales, Warren Foundry & Pipe Corp., New York, subsidiary of Warren Pipe Co. of Massachusetts, Everett, Mass., and Phillipsburg, N. J., died Oct. 29. Mr. Morrison had been associated with Warren Foundry & Pipe Corp. for the last 32 years, the last 17 as vice president in charge of sales.

• • •

William A. Mallery, 74, president of Hillsdale Foundry Corp., Hillsdale, N. Y., died Nov. 5, following an illness which forced his retirement last year. Mr. Mallery, when he became president in 1940, modernized the plant which his father founded in 1836, adding production of machine tool castings to its line of plows, pipe and jobbing castings.

• • •

Frank B. Foley, 74, president and general manager, Fruit Machinery Co. Ltd., Belleville, Ont., died Oct. 17. A native of Ontario, N. Y., Mr. Foley went to Ingersoll, Ont., in 1911 and established a business there. In 1917 he acquired the Walker Foundry in Belleville, which he built into Fruit Machinery Co.

• • •

Albert E. Harrison, 81, who retired in 1934 as superintendent of foundries and pattern shops, Allis-Chalmers Mfg. Co., Milwaukee, died Dec. 2, at his home in Hollywood, Calif. Mr. Harrison was a native of Shropshire, England, and was taken to Milwau-

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kee by his parents when very young. He joined the former E. P. Allis Co. in 1881 and was regarded as one of the outstanding foundrymen in the country and a leading authority on production of heavy gray iron castings. He was a former national director of the American Foundrymen's Association.

• • •

Alexander Kilpatrick, 82, former treasurer of the A. Kilpatrick & Sons Foundry Co., St. Louis, died there Nov. 23, at Alexian Brothers Hospital. Mr. Kilpatrick had been treasurer of the company for 45 years prior to his retirement 4 years ago.

• • •

John R. Van Fleet, 66, chairman of the board of directors, U. S. Vanadium Corp., unit of Union Carbide & Carbon Corp., New York, died Nov. 10. Mr. Van Fleet began his association with a unit of Union Carbide in 1916.

• • •

Alfonso B. Addington, plant superintendent and personnel director, McWane Cast Iron Pipe Co., Birmingham, died at his home there, Nov. 7. Mr. Addington was a member of the American Foundrymen's Association.

• • •

George F. Nye, 83, president, Dobbie Foundry & Machine Co., Niagara Falls, N. Y., died there recently.

Schedule Wisconsin Foundry Conference

Annual Foundry Conference of the Wisconsin Chapter, American Foundrymen's Association, will be held at Hotel Schroeder, Milwaukee, Thursday and Friday, Feb. 12-13. This will be the eleventh of what has developed into the best attended of the various regional conferences sponsored by AFA chapters. The University of Wisconsin has co-operated with the Wisconsin Chapter in sponsorship of the annual Milwaukee event.

This year it is planned to hold 24 sectional meetings during the two days, with gray iron, malleable iron, steel, nonferrous, patternmaking, and technical groups represented. The program also will include a banquet Thursday evening and luncheon meetings on Thursday and Friday, all of which will have speakers of national reputation.

Tickets for the entire conference, including meals, are priced at $10. Chairman of the committee in charge of the affair is chapter Vice President, R. C. Woodward, Bucyrus-Erie Co., South Milwaukee.

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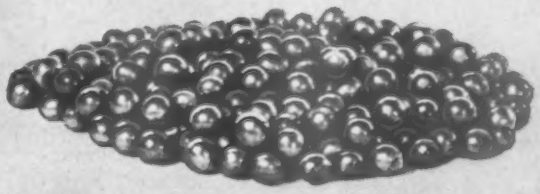

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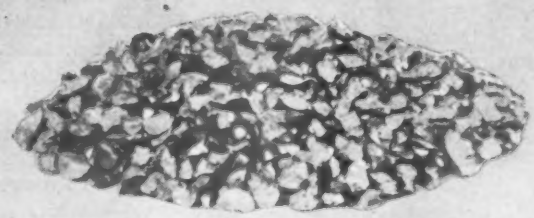

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Industry BRIEFS

MULLINS Non-Ferrous Castings Corp., 1800 South Eighteenth St., St. Louis, recently was formed and is now in production. Turning out nonferrous castings weighing 1 oz to 400 lb, the plant has a capacity of 10,000 lb of aluminum or 25,000 lb of brass daily. The new concern purchased property and equipment from Acme Brass Foundry, which had been completely fitted with modern equipment the last two years. President of the new corporation is Fristoe Mullins. Tom C. Clark is vice president and sales manager, and James M. Smith is vice president and production manager.

• • •

Linde Air Products Co., unit of Union Carbide & Carbon Corp., New York, is constructing an oxygen-filling station and acetylene-producing plant at Creve Coeur, on Wesley Rd., just outside the city limits of East Peoria, Ill. Plans also include a warehouse for the distribution of carbide. The new facilities are expected to be in operation about Jan. 15.

• • •

Elliott Foundry & Machine Works and Pneumatic Gate Works, both of 3335 S. Ridgeway Ave., Chicago, have been purchased by the Glynn-McKeon Corp., a newly formed corporation with E. Kevin Glynn as president and James P. McKeon as vice president. Original company names will be retained under the new ownership. William P. Elliott, who was owner-operator of both companies, has retired. Mr. Glynn, formerly in charge of sales in the state of Illinois, Super Steels Inc., Cleveland, will direct the Pneumatic Gate Works division, and Mr. McKeon, formerly sales engineer, Gunite Foundries Corp., Rockford, Ill., will be in charge of the Elliott Foundry & Machine Works division.

• • •

Formation of Lukens Aluminum Co., Dayton, O., an aluminum alloy die casting plant, has been announced by R. E. Lukens, president, Central Tool & Die Co., 330 West Monument Ave., Dayton 2. New plant is headed by W. B. Kindrick, general manager, Charles Briggs, factory manager and James L. Erickson, director of sales and engineering.

• • •

Interstate Foundry Co. Inc., 3823 Massachusetts Ave., Indianapolis, recently completed extensive improvements including a 60-ft extension to the coreroom, two new cupolas and increased floor space for molding.

• • •

Permalite Castings Corp., Winchester, Ind., changed its name to Aluminum Foundries Inc., as of Nov. 1. More than 50 per cent additional floor space has been added to its manufacturing facilities as the result of recent building additions and improvements.

• • •

Winters Foundry & Machine Co., 4125 Mahoning Rd. N. E., Canton 5, O., recently moved from its old location at 1733 Olive Pl. N. E., Canton, and has been incorporated with $150,000 in common stock. Manufacturing space has been increased.

• • •

Koehring Co., 3026 West Concordia Ave., Milwaukee 10, plans a 75 x 150-ft foundry addition of brick and concrete slab. A new sandslinger and other equipment has been ordered for the new addition. The Meehanite casting process is to be used.

• • •

Acme Metal Die Inc. has been formed with a capital of $200,000 to engage in a general manufacturing die casting and machine shop business. Headquarters are at 212 East Seventeeth St., Los Angeles 15.

• • •

Vibracast Precision Products, 876 Spruce St., Freeland, Pa., recently was started by J. L. Gibney. Company specializes in stainless steel castings under 100 lb.

• • •

South Side Foundry Co., 2900 South Washington St., Peoria 2, Ill., has obtained building permit for repairs totaling $15,000. Company plant was damaged by fire Oct. 16.

• • •

Malvern Foundry Co., Malvern, Ark., has been established by C. D. Rudolph, L. D. Rudolph and Randale Hughes. Company will manufacture gray iron and alloy castings.

• • •

Hill Acme Co., 6400 Breakwater Ave., Cleveland, plans construction of a $55,000 addition to provide additional space to the foundry and shipping building.

• • •

Crucible Steel Casting Co., 2850 South Twentieth St., Milwaukee 7, has changed its corporate name to Crucible Steel Casting Corp.

• • •

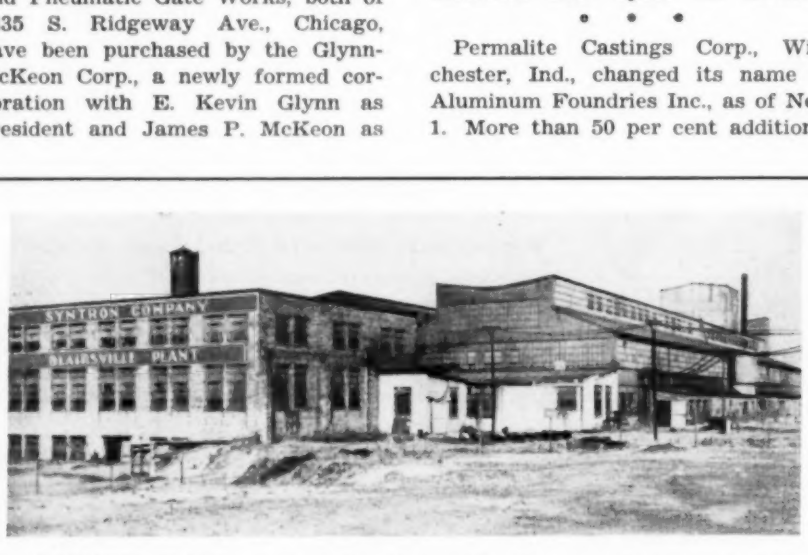
Kankakee Foundry Co., 2081 West Station St., Kankakee, Ill., suffered $100,000 fire damage to the main part of its foundry Nov. 17.

• • •

Humphreys Mfg. Co., 201 East Fifth St., Mansfield, O., has started construction of a $130,000 foundry building at that address.

• • •

Chemalloy Foundry Co., Louisiana, Mo., which was razed by fire Oct. 20, is being rebuilt.



ACQUIRES PLANT: Syntron Co., Homer City, Pa., manufacturer of vibratory material handling equipment and portable construction and maintenance tools, has purchased the former H. K. Porter Co. shell plant at Blairsville, Pa., 12 miles from Homer City. Plant will add 100,000 sq ft of modern manufacturing facilities to company's main plant at Homer City. Plans are to transfer the manufacture of large, heavy-duty vibratory feeders and conveying equipment to Blairsville, thus releasing manufacturing space at the main plant.

STEEL CASTINGS

(*Continued from page* 69)

on the investments used and the operations required. Space does not permit a review of all these developments but a good summary has been prepared.(18) The higher alloy steels are the ones predominantly used for precision casting methods; however, developments have resulted in adapting carbon and low alloy steels to the lost-wax proceess. Progress has also been noted in the centrifugal casting of steel. The German wartime developments were reviewed(19) and production information on the centrifugal casting of large steel tubes has been presented.(20) Work has been done by English investigators on structures and casting speeds which have increased the general knowledge on the centifugal process for steel.(21)

Gating and Feeding—The universal use of necked-down risers was of considerable assistance in speeding up casting production by reducing the number of operations in the cleaning department and decreasing costs. The use of necked-down risers has been extended to side-feeding risers, blind risers and to risers that are attached to castings of various contours. Studies by the Steel Founders' Society on experimental and production castings have shown that necked-down risers can be used in casting sections which require feed risers upward of 36 in. in diameter. Also these studies indicate that refractory cores for necked-down risers are giving good service and standard shapes are advantageous in many applications.

Another feeding problem that has been effectively investigated during the past year by the Steel Founders' Society is the study of the factors which influence feed riser efficiency. For the first time methods have been devised for calculating the riser dimensions required to properly feed various casting sections. The information developed is at present being used in the planning of risers for production castings. Riser efficiencies which permit casting yields of from 60 to 80 per cent can be obtained by the application of the methods developed. Experiments on the pressure feeding of steel castings with pressures greater than atmospheric have been reported upon recently(22) and this method of feeding is being investigated by a number of steel foundries and by the Steel Founders' Society.

Thermit-type mixtures which liberate much heat and provide very ef-

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ficient slag cover insulation have been developed as anti-piping compounds. The use of these materials permits a reduction in riser heights, thereby increasing casting yields. Similar materials, prepared as insulating pads which can be used around risers or at sections that should be kept from freezing to permit directional solidification have also been developed and used by industry.(23)

The fluidity of cast steels has been given further consideration in view of the fact that the running qualities of steel are important to the foundryman. A standard test and procedure have been developed after a complete review of all published studies on fluidity testing.(24)

Cleaning Castings and Welding—Problems dealing with cleaning room operations and the cleaning of steel castings have also received major attention. Such items as evaluation of grinding conditions, grinding wheel efficiency tests, chipping procedure control, flame gouging and plant layout have all received careful consideration. Likewise a series of extensive studies has been made on the factors governing the ease of flogging of necked-down risers. The effect of neck size, shape, metal composition and casting temperature have been investigated and made available to the industry.(25)

Welding studies on cast steel(26) indicate that cast steels respond to welding substantially in the same manner and degree as rolled steels. The bend angle for cast steels tended to be lower than that of rolled steels of the same type. The higher silicon contents of the cast steels are responsible for this difference. However, the cast steels cracked much less than rolled steels of comparable carbon equivalent.(26)

Heat Treatment and Metallography — Considerable information has been developed the last two years on the hardenability of cast steels and the method of producing steel castings to hardenability specifications. The Society of Automtive Engineers has adopted a new specification on steel castings for automotive use. One portion of this specification requires the supplying of alloy steel castings to hardenability values. A symposium on the production of steel castings to hardenability specifications was presented by five authorities of the steel casting industry before a conference of the Steel Founders' Society.(27)

The effect of homogenization treatment on cast steel has been carefully studied and reported to the industry.(28) Heat treatments employing high temperature homogenization treatments, above 1650 to 2100° F, for short or long time periods are not effective in materially improving the impact and hardenability properties of cast steel. The effect of time of heating at the homogenizing temperature beyond a reasonable minimum period is negligible. Valuable information on the heat treatment of heavy cast steel sections has also been reported.(29)

An excellent report has been prepared by Carnegie Institute of Technology for the Steel Founders' Society on the austenite grain size of cast steels.(30) This indicated that five methods may conveniently be used simultaneously in measurement of the austenite grain size of carbon and low-alloy cast steels. These methods are: Martensitic etch; gradient quench; normalizing; fracture and oxidation. The martensitic etch method gives correct results and is the most consistent in revealing austenite grain size of the methods studies. Its use as a routine foundry laboratory test was recommended.

The causes and prevention of intergranular fracture in cast steel have been investigated.(1) The primary cause was found to be aluminum nitride precipitation at primary grain boundaries. Steels high in nitrogen content and containing residual aluminum may be susceptible to this "rock-candy" type of fracture.

Properties—A number of research studies have been completed the last two years on the properties of steel castings. Details of these studies will not be presented here but will be mentioned so that the reader can refer to the full report of the investigations. The results of studies on the effect of tin on cast steels(31) show that tin is not harmful to the tensile properties but has a detrimental effect upon impact properties, particularly at low temperatures. Copper increases the yield and tensile strength and yield ratio of cast steel. Steels with copper contents above 0.6 per cent are age hardening. If the carbon content is kept below 0.20 per cent, the copper cast steels have excellent weldability and low temperature impact properties.(32) No correlation was found between the melting practice and the notched bar impact properties of 28 cast steels.(33)

CHARLES W. BRIGGS, author of the article on the steel casting industry, received his early education in the schools of California where he was graduated from Stanford University. Since then he has devoted most of his time to research work, originally with Standard Oil Co. of California and Pacatome Ltd., San Francisco, and later as physical metallurgist with U. S. Naval Research Laboratory, Washington, where he became head of the steel castings section. In 1938 he became technical engineer with the Steel Founders' Society of America, Cleveland, where he is now technical and research director.

Study Mechanical Properties

Nickel strengthens cast chromium-molybdenum cast steels without undue reduction of ductility and impact resistance. This effect is most pronounced in the low-chromium-low-carbon steels.(34) The mechanical properties of a number of low-alloy cast steels together with information on their hardenability and low temperature impact properties were determined for production steels as made by the different melting practices. The steels show properties comparing favorably with those of wrought low-alloy steels.(35)

The relation of quenching rate and hardenability to the mechanical properties of several heat treated cast alloy steels has been investigated using the double end quench test to give quenching rates equivalent to those of 2 to 8-inch thick sections. Accentuated segregation in cast steels militates against increasing the alloy content for the heavier sections. The optimum mechanical properties were indicated to be coincident with the minimum hardenability which produces maximum hardening for any particular rate of cooling.(36) The properties of carbon and a number of low-alloy cast steels have been presented to indicate values that are normally expected in the manufacture of steel castings.(37)

The steel casting industry has been following with particular attention the developments in nondestructive testing. The American Society for Testing Materials has recently issued radiographic standards for steel castings which will be of material help to the industry and to purchasers of steel castings in the establishment of acceptance standards. The effective use of magnetic particle testing has

(*Concluded on page* 186)

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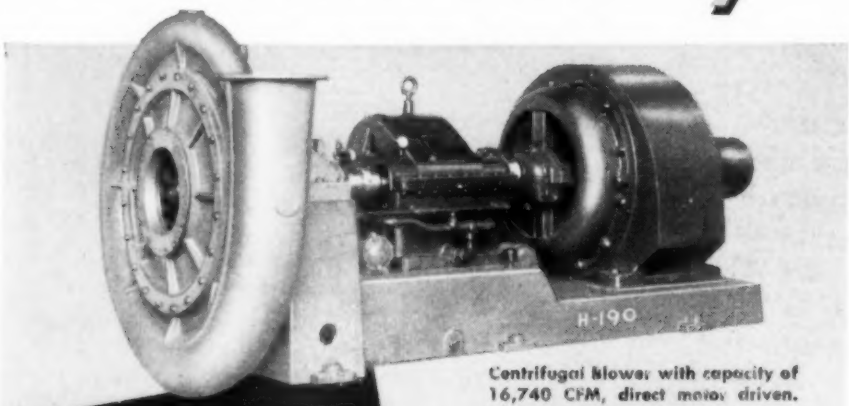

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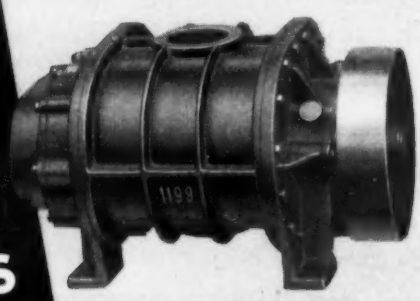

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(*Concluded from page* 184)

also been carefully considered and studied during the last two years.

Quality control of the product has received much attention by men in the steel casting industry.(38) High quality steel castings consistently produced in large quantities by many companies is the goal of the industry.

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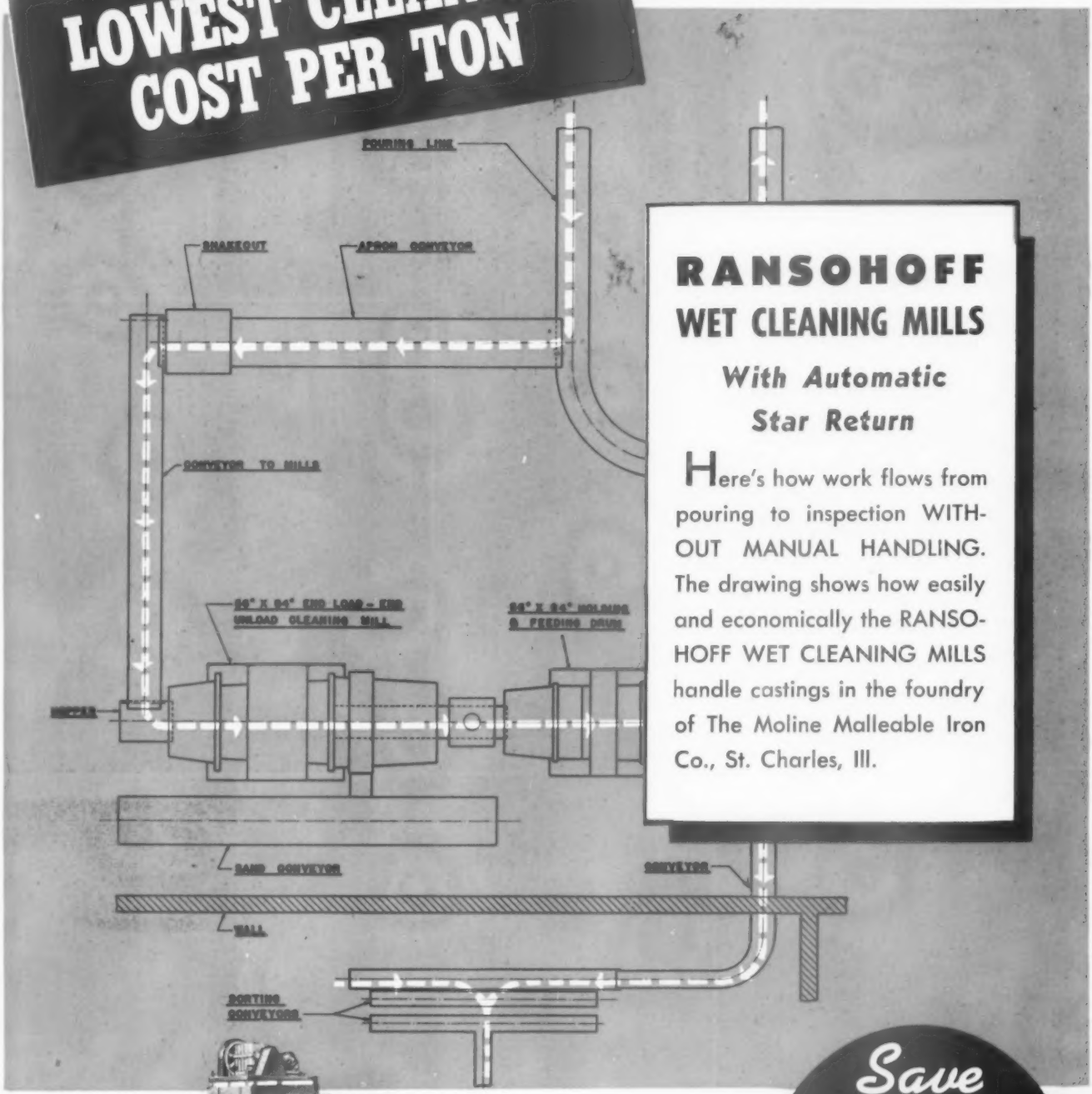

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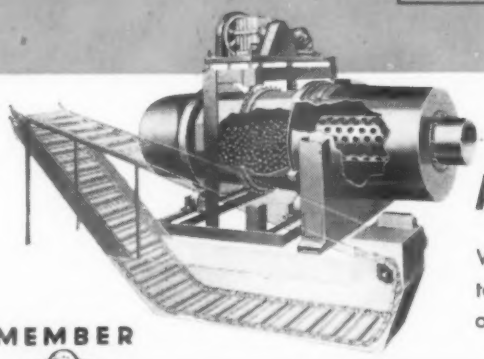

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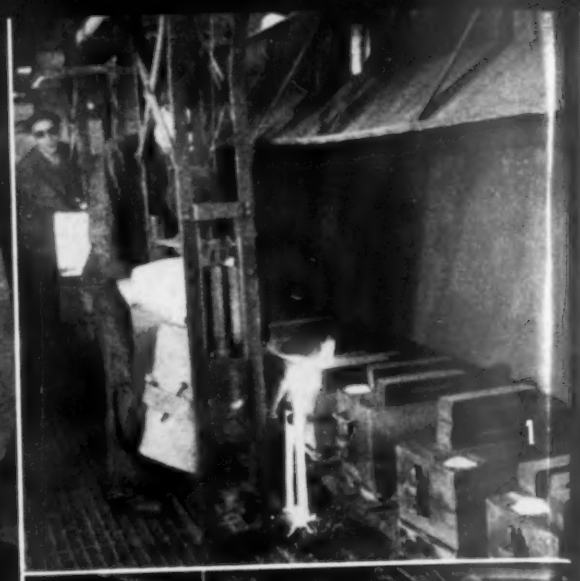

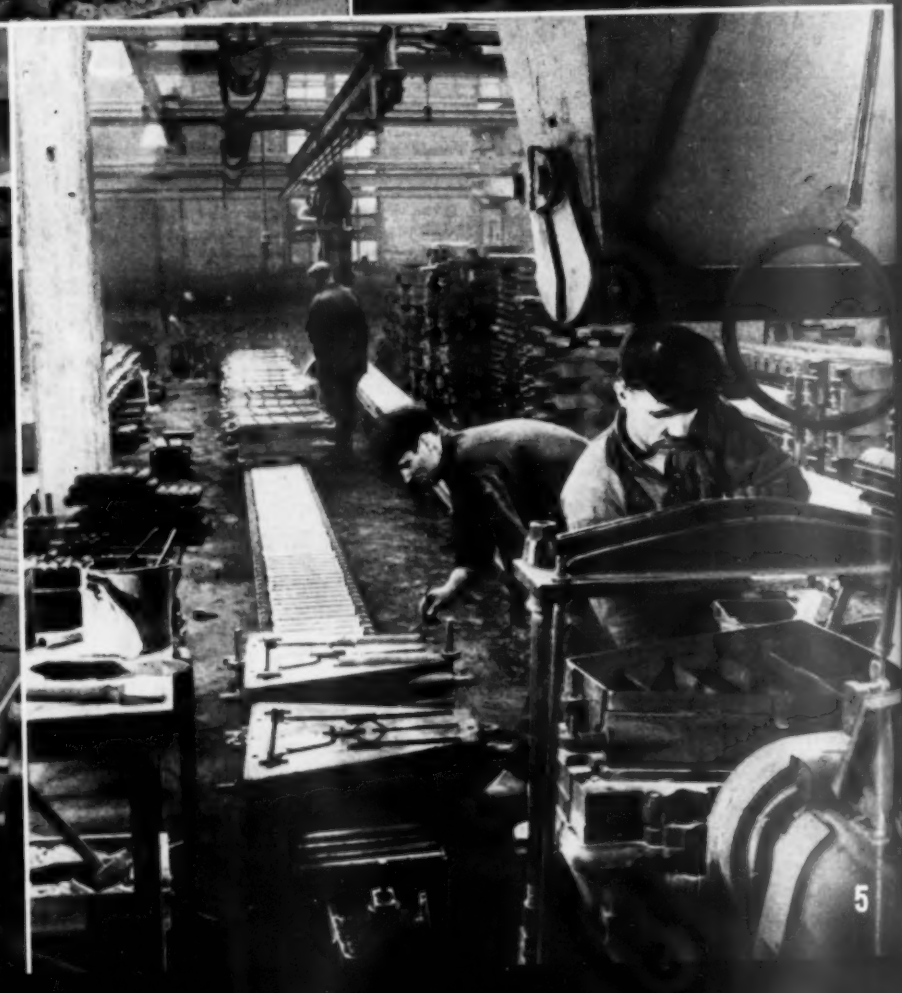

MECHANIZED POURING

in a Swedish Foundry

By I. FORSLAND
Chief Metallurgist
S K F
Katrineholm, Sweden

IN the November, 1946, issue of THE FOUNDRY an article was published entitled "Simplifies Cylinder Block Pouring." (This article described a cylinder block pouring installation by Buick Motor Division which incorporated a motor-driven ladle plus a strong exhaust hood at the pouring platform.—Ed.) It was stated that "the equipment is believed to be the first of its kind installed in a production gray iron foundry," but I cannot desist from mentioning that, since 1934, a similar arrangement has been employed in the SKF foundry in Katrineholm.

This equipment is used for pouring cylinder blocks, as shown in Figs. 3 and 6, as well as smaller molds. The smaller molds are either set out on a roller conveyor—as seen in Figs. 2, 4 and 5—or are moved on a car type mold conveyor system (Fig. 1). It will be noted that the pouring ladle is suspended from an electric hoist and is controlled through pushbuttons built into the handwheel.

Before installation of these mechanical ladles the pouring of 40 cylinder blocks by 10 operators required 3 hours. The mechanized equipment permits this pouring to be accomplished by two operators in one hour.

It also may be of interest to describe briefly the Swedish high-frequency furnaces used for the production of high-strength cast iron. Two furnaces of 6 tons capacity each are connected to a joint motor-generator set, and can be operated in parallel. The motor-generator set consists of a three-phase induction motor of 1850 hp, coupled with a generator delivering 1250 kw at 2500 v and a frequency of 743 cycles.

Normal melting time from loading to pouring is 3 hours for a charge of 6 tons, about 45 tons being produced in two shifts per day. This metal is partly cylinder cast iron and partly Meehanite. The furnace installation, one of the first in Sweden, has been in production about two years. We are producing much cheaper iron from it than from the cupola, although the cost of electric power —about 0.85-cent per kwh—is not as low as that for most Swedish industry. Chiefly responsible for the low price of cast iron are the cheap cost of raw materials and the high yield obtained.

Consumption of cooling water is about 100 cu m in 24 hours. By piping this water to wash basins and showers we are saving approximately 400 tons of coal a year.

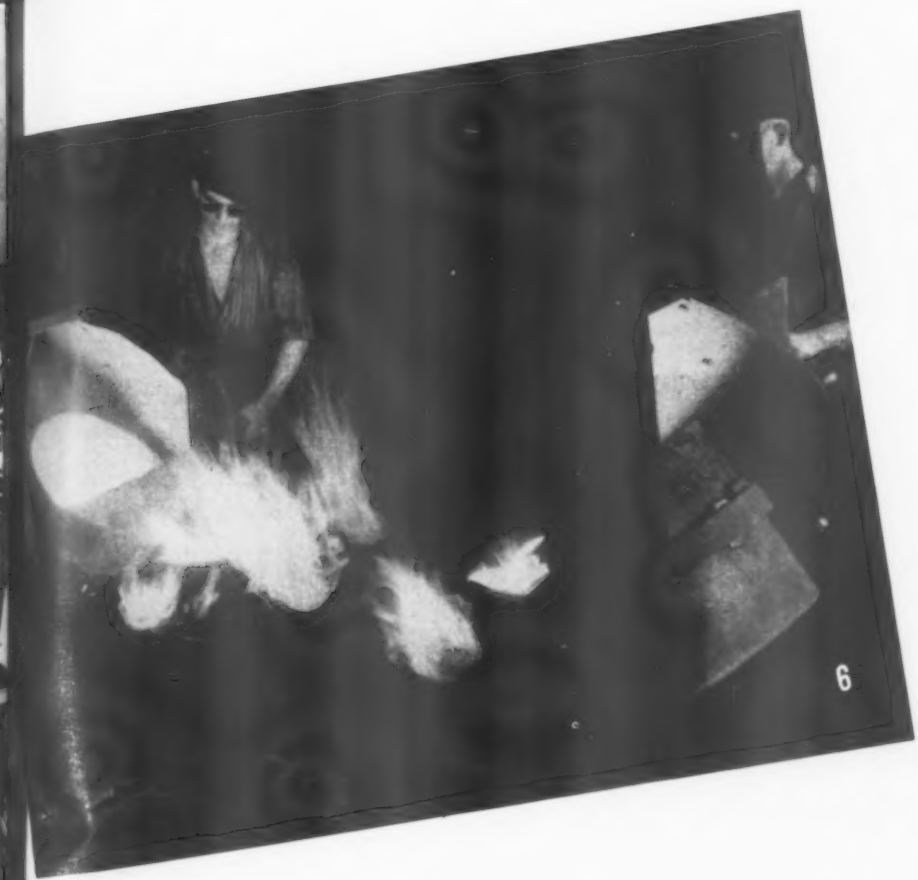

Fig. 1—Pouring on a mechanized mold conveyor

Fig. 2—Close-up view of the pouring device

Fig. 3—Cylinder block molds ready for pouring

Fig. 4—Small castings being poured on roller conveyor

Fig. 5—Finishing molds for small castings preparatory to pouring

Fig. 6—Pouring a cylinder block from two ladles

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ASTM Meeting To Be Held in Detroit

The 1948 annual meeting of the American Society for Testing Materials will be held at Detroit June 21 to 25. Headquarters will be at the Book-Cadillac Hotel where the eighth exhibit of testing apparatus and related equipment will be held. While the final program for the meeting has not been completed, the following suggestions are under study and development: Symposium on conditioning and weathering; symposium on methods of reproducing large numbers of parts; creep, stress rupture and short-time high-temperature tension testing; roundtable discussion on spot identification test; symposium on mineral aggregates; symposium on gas turbine materials; symposium on magnetic materials, and symposium on latest methods of x-ray and gamma-ray inspection.

Committee Week will be held in Washington at Hotel Statler, Mar. 1 to 5. It also is expected that the annual spring meeting will be held at that time.

Employees Honored

Sterling Wheelbarrow Co., Milwaukee, on Sept. 20 sponsored a celebration in honor of its employees with 25 or more years of service. New members of the "25 Year Club" were awarded a gold pocket watch and chain.

The 15 active members of this club with service ranging from 25 to 42 consecutive years are: Irving Smith, Ed Mueller, Bill Anstett, Herb Frank, Charlie Kaseckert, Augie Spiecherman, Dick Jordan, George Vodicnik, Elmer Hamilton, Mike Lenk, Pete Koenigsberger, Frank Potocher Sr., George Lambkin, Martin Dooley and John Pavlekovich.

In addition to the gold watch awarded to employees with 25 consecutive years of service, the company makes a $25 cash award to employees for each 5-year period served above the 25-year basic period.

To Hold Conference

Third Instrument Conference and Exhibit will be held at Convention Hall, Philadelphia, Sept. 13 to 17, 1948, and is sponsored by the Instrument Society of America in co-operation with American Institute of Physics, American Society of Mechanical Engineers, and American Institute of Electrical Engineers.

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The adventures of BILL

By PAT DWYER

Drawings by RICHEY

THE other day," Bill said, "I heard a story that gave me a great deal of pleasure. All about a clergyman, a great brawny, two-fisted fighting lad who knew exactly what to do under all kinds of conditions, and had the goods to back up his opinions, when and if it became necessary to show any person, or bundle of persons, who was who and what was what."

"For a grown-up man who has been, as the saying goes, through the mill, you show the most innocent and childlike faith in reports, rumors and stories that would pass in through the ears and out through the elbow of any ordinarily intelligent person over the age of seven. Clergymen of any and every faith are exponents of peace. Consequently, even where certain combinations of circumstances raise the pressure and temperature of the blood stream to the boiling point, they must exercise the most heroic restraint, pass out the soft answer and keep the hands meekly folded."

"Far be it from me to wake you out of pleasant sleep, but if you listen carefully for a few minutes, I'll quote you some extracts from the ceremony known here and there as the laying on of hands. The only difference between this version and the original is that, in this instance, the hands are folded or, perhaps more properly speaking, are doubled into hard, vicious bone-crushing fists.

"The duties of the clerical gent I referred to in the beginning carried him over a wide range of territory, including a string of lumber camps where might was right and where a peavey or a cant hook usually determined the finer points of an argument.

"He arrived at one of these camps in the afternoon. After supper he invited the men to gather around for a little informal and friendly talk. The majority of the men were inclined to view the visitor with friendly interest. A few, headed by Black Dan, the camp bully, looked upon the man as an alien and the purpose of his visit an unwarranted intrusion on their rights, liberties and privileges.

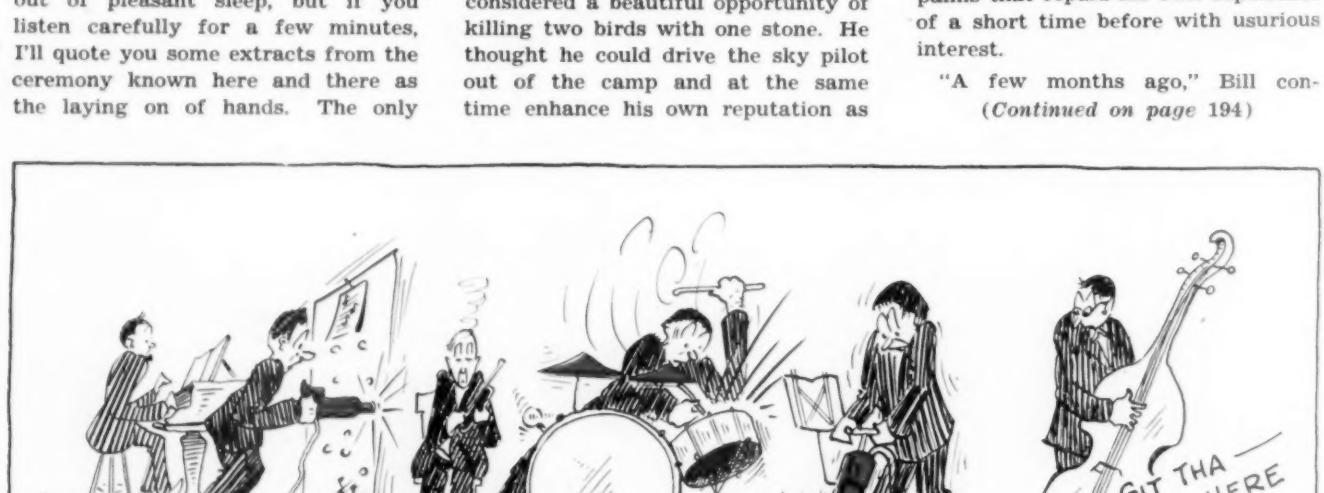
"At a certain point in his talk the apostle of peace stopped and invited questions from the crowd. Black Dan immediately jumped at what he considered a beautiful opportunity of killing two birds with one stone. He thought he could drive the sky pilot out of the camp and at the same time enhance his own reputation as a bad man, one who ate 'em raw and who ate 'em rare. He asked the preacher point blank if he was prepared to back up his teaching. Would he turn one cheek if struck on the other? He would. Dan lost no time in testing the truth of the statement. He walked up in front of the missionary and deliberately slapped one cheek. When the other cheek was turned he also slapped that. He then stepped back to wait for the next move. He did not have long to wait.

" 'My dear friend,' said our hero, 'in a somewhat diligent perusal of the Scriptures extending over a period of many years, I never have seen any reference on how a man is supposed to act after his enemy has smitten him on both cheeks. I am led to assume that a man is justified at that point in laying down a law for himself, or in acting according to the dictates of his conscience. Therefore I assure you I anticipate the most exquisite pleasure in pounding into you the rudiments of good manners, a little common courtesy in the event another wayfarer comes this way, and enough of the basic element of all religions to start you on the way of eventually saving your immortal soul.'

"According to the account later joyfully relayed to civilization, he not only made good on all three counts, but he also added a few vicious uppercuts by way of good measure and concluded the ceremony of conversion by a right and left hand swing to either cheek with his open palms that repaid his own experience of a short time before with usurious interest.

"A few months ago," Bill con-

(*Continued on page* 194)



Only Mr. Petrillo can decide whether these performers are musicians in the original and exact meaning of the word

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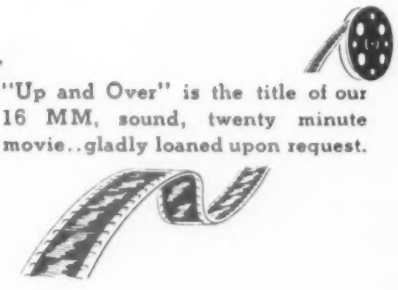
★ "Up and Over" is the title of our 16 MM, sound, twenty minute movie..gladly loaned upon request.



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- Blowing Out Cores
- Chipping Castings and Billets

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

(*Continued from page* 192)

tinued, "I had the privilege and pleasure of joining to a modest extent in one of these eye-for-an-eye and tooth-for-a-tooth things. The affair was not quite as gory and heroic as the trimming exercise in the lumber camp, but on the whole it was a very satisfactory exhibition."

"By a not too violent effort of the imagination, I can realize your attitude in regard to the eye-for-an-eye angle, but the old imagination is not strong enough to see you waiting for the slap on the second cheek, before starting in to collect the aforesaid eye. That, I should have to see with my own two bright little eyes."

"Perhaps," Bill said, "I had better begin at the beginning—"

"The method," I admitted, "has certain advantages. It enables the spectator or auditor to kind of catch the general drift, instead of listening to a flow of words that convey no more information than a sounding brass or a tinkling cymbal."

"A tinkling cymbal, hey? The inventor of that phrase should have his ears reamed. I have no definite proof to offer, but the general impression among band and orchestra men is that boozy eyed Bacchus, drum beater extraordinary, also invented the cymbals for the left hand while he pounded the drum with a noble mallet in the right hand. Looking down now from high Olympus the old boy probably sighs—and hiccups—in regret that he was snapped away from the wine press, the drum and cymbals, before he ever had a chance to really go to town behind a riveting gun or a pavement breaker."

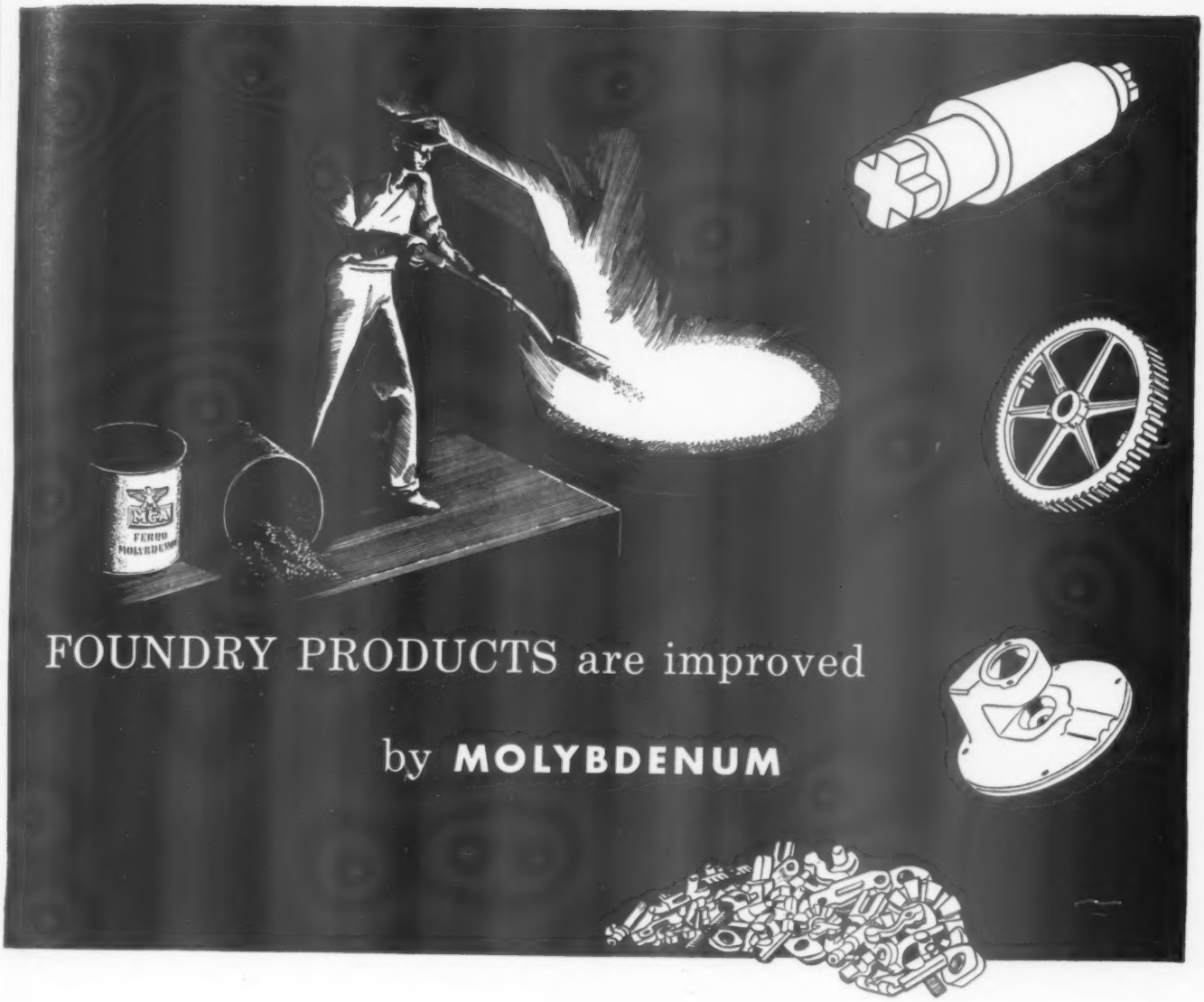
'Is that the beginning of the story you were going to tell me?"

"No indeed. This here little story, which I am highly gratified to note you are dying to hear, is all about a flock, or bevy, or bunch or group of dear little children who never knew or heard of the first gent to look with approval on the wine when it was red in the cup. In fact, their IQ in the field of general knowledge practically was on a par with that of a recent contestant in a beauty show. When asked to name the capital of Massachusetts, the beautiful creature smiled engagingly and murmured 'Petroleum.' One shudders to think of the result if she had been asked to spell the name of the old Bay State."

"Now that you have struck oil, I presume that is the end of the story?"

"Not at all, my dear impatient young fella. I am just kind of ar-

(*Continued on page* 196)



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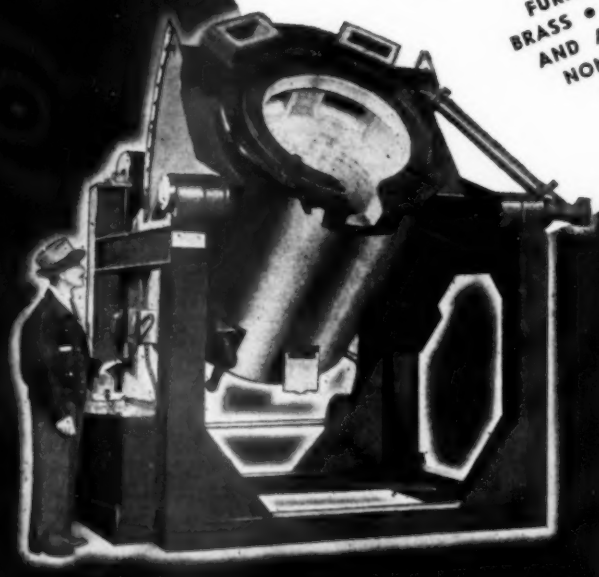

The Campbell-Hausfeld Co.

300-320 MOORE ST. HARRISON, OHIO

(*Continued from page* 194)

ranging the scenery and stage props before running up the curtain on the first act in the local drama, which appropriately enough might be entitled 'Heaven Defends The Innocent, or The Biter Bit.'"

"Sounds rather promising. Who was the biter, and who bit him? I trust the teeth were long, sharp and pointed enough to do a creditable job. From the title I assume that a party of the first part, name at present unknown, had been practicing a bit of skullduggery on the party of the second part. In the usual miraculous storybook technique, the party of the second part reverses the program. In the expressive language of the day, what happens to the party of

The end of a perfect day

the first part, shouldn't happen to a dog."

"For an amateur," Bill remarked judicially, "you ain't doing so bad. A little weak perhaps on some of the minor details, but quite properly grounded in the fundamental or basic principles.

"When the schools reopened in September, all the boys and girls of school age, fearfully and wonderfully dressed and with shirt tails flying to the breeze, were dragged from their favorite hunting grounds, and figuratively chained to the galley oars for the greater part of each day. The little ones, up to the age of five, remained at home to play, to kill time and to bring their parents to the verge of a nervous collapse forty times a day, through a total disregard of all advice, orders, threats, promises and pleadings on the subject of safety. They climbed trees and ladders ,turned water taps, pulled flowers out by the roots, threw the

(*Continued on page* 198)

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(*Continued from page* 196)

contents of a sand box in all directions and engaged in other little innocent games. About every hour they opened and then slammed the door—any door in the neighborhood—and boldly demanded food and drink. In some instances choice of refreshment graciously was left to the discretion and assumed generosity of the donor, but in the majority of instances, all the necessary specifications definitely were laid down.

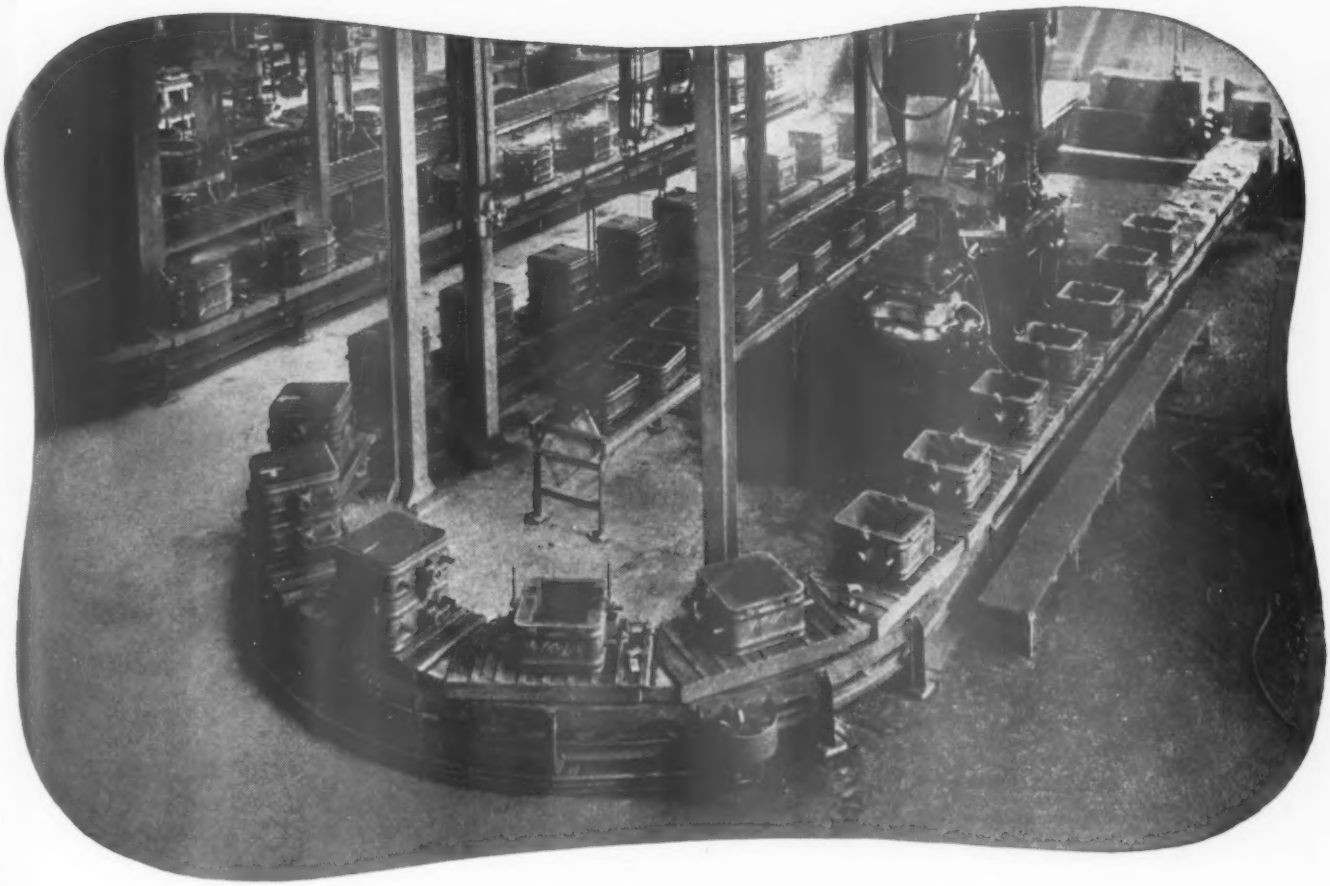
"Then one day a big, 13-year old, ugly lump of a lad with all the characteristics and instincts of a thug, a dacoit, a roughneck, a bully and a bandy-leg bum—I am now quoting one of the mothers—stumbled into a group of the little ones. He was about as welcome and popular as a hawk in the chicken yard, or the famous old-time fancy dress marauders who came down like a wolf on the fold. He pushed the little ones around, knocked them down, pulled their hair, twisted their arms, slapped them indiscriminately, sent them howling to their respective homes, then jumped on his bicycle and went away laughing heartily.

"The mother of two of the little victims hinted that by taking a modest part in the controversy I might add another star to my crown. She would not go so far as to instruct me on how the work should be done, but she thought the ends of justice would be served, if the disturber of the peace was put away in a nice peaceful place—say a hospital—for about a week.

"By a curious coincidence on the following day, while deciding on how far I could go without running the risk of having a solemn old judge slap a fine on me, or condemning me to a period of hard labor in the calaboose, I was favored with a visit from two 12-year old rough and tumble veterans, Sickem and Sockem. Without a doubt the finger of providence definitely was pointing in my direction.

"These names had been earned honorably in a constant feud with the members of another school. Apparently no person knew where or when the feud originated, but over a period of many years the scholars of school No. 1 and school No. 2 regarded each other as deadly enemies. Chance meetings of groups or individuals always ended in a fight. Deplorable, of course, and against all dictates of common sense, but emblematic of the same old human nature that has kept the world in a turmoil of big and little wars

(*Continued on page* 200)



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Traveling in an endless loop past the molding stations, the pouring zone, along the cooling run to the shakeout, and back to the molders again, Bartlett-Snow continuous mold conveyors enable foundry owners and plant managers to get a maximum of both quantity and quality from their plants. Individually engineered to your own particular plant requirements, Bartlett-Snow foundry equipment reduces the number of defectives, increases output, reduces costs, minimizes labor difficulties by giving the workers a larger take home pay, easier. And smoother, more continuous production returns increased profits, larger dividends to you. Can we send you more detailed information?

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FOUNDRY SAND, MOLD AND CASTINGS HANDLING

(*Concluded from page* 198)

since the world began."

"Another time," I said. "Another time. What about this pair of battlers Sickem and Sockem? Did you persuade them to take on the little job of showing the rowdy the error of his ways?"

"Persuade them? Are you kiddin'? Sickem assured me earnestly that he couldn't think of anything that would give him greater pleasure. He felt quite confident that he could do the job himself, but he was afraid Sockem might feel slighted if he was not allowed to at least take part in the preliminary work, and maybe a bit of mopping up at the close. As a slight token of esteem and appreciation I presented Sickem with a finely executed steel engraving of the Father of his country. Following a mild and half-hearted protest, this was accepted in the same hearty man-to-man fashion in which it was offered. Even Sock was moved to offer his one and only contribution to the conversation. 'Gee' says he. 'Now you can get 'em Sick.'

"Get what?"

"How do I know? Probably a set of brass knuckles. As they slid through the doorway, one treading silently in the footsteps of the other in approved Indian style, Sickem called back over his shoulder 'Bye, Gramp. What day would you like me and Sockem to go out and give this guy the works?' "

"That's no way," I remonstrated, "to end a story. Did they stand by their promise? What about the details, the stealthy approach, the concealment, the sudden descent, the dust and torn clothes, the violent screams and all that kind of stuff. Did they—er—mop him up?"

"Yes," Bill smiled in placid content, "they did."

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STABILIZING EMPLOYMENT IN THE GRAY IRON FOUNDRY

(*Continued from page* 99)

ence is bad may find himself assessed with a penalty rate up to 4 per cent. For example, let us take an employer who has an annual payroll of $100,000. If his rate is 2.7 per cent, he will pay $2700 in taxes to the state. If his rate is 1 per cent, he will pay $1000. If his rate is 0 per cent he pays nothing. On the other hand, if his rate is 4 per cent, he pays $4000.

Immediately, upon the passage of the Unemployment Compensation Act of 1932, Wisconsin employers, now having found an incentive, began to think in terms of stabilizing employment.

In 1935, Congress passed the Social Security Act and incorporated therein a 3 per cent federal unemployment tax on all employers who employed 8 or more employees. Against this 3 per cent tax an employer was allowed a credit up to 90 per cent for any contributions paid to a state unemployment compensation fund, provided the state law met the standards set up by the Federal Security Board. If the state did not have an unemployment compensation law on its books, the employer paid the full 3 per cent to the federal government. The federal government, of course, pays no benefits and the money thus collected is reallocated to the various states for the administration of their law. Consequently, employers in states with no unemployment compensation law rushed to their legislature to enact one. The result is that today every state in the United States and its possessions

(*Continued on page* 202)

This VETERAN WINS RESPECT *Wherever it works*

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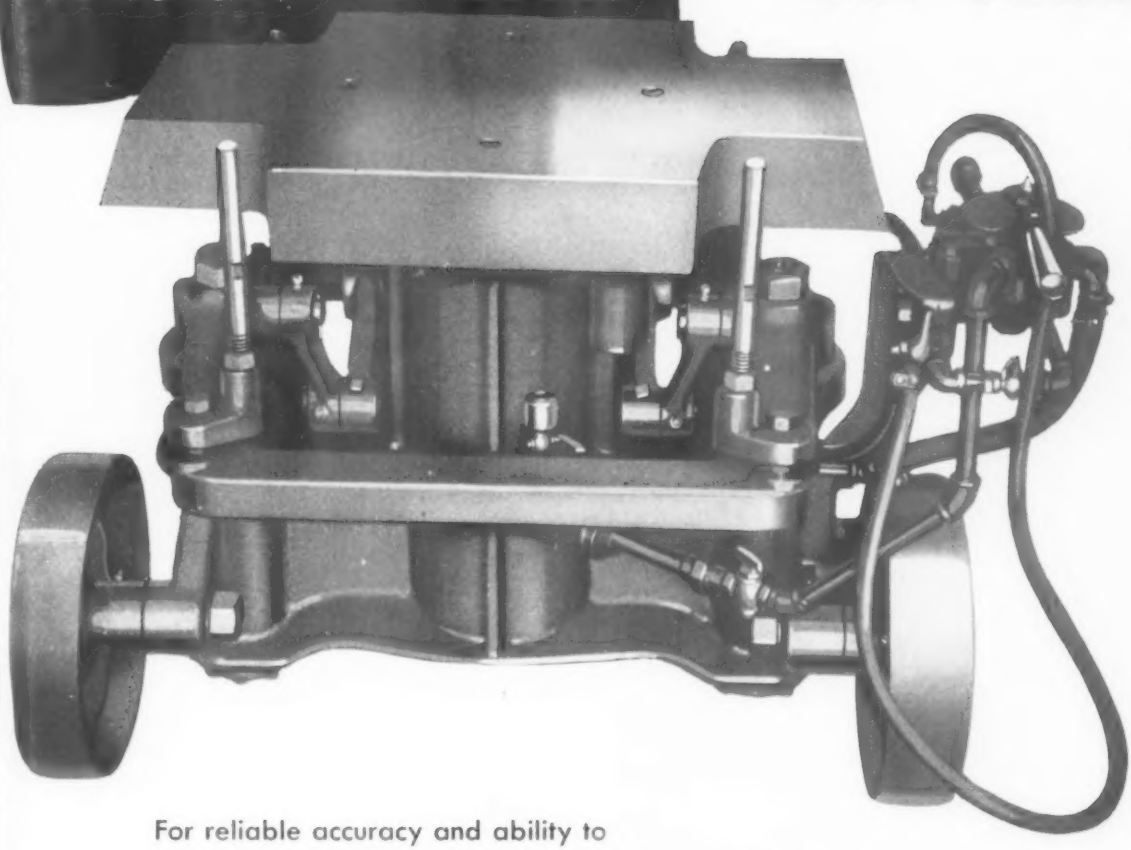

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ARCADE MANUFACTURING DIVISION

ROCKWELL MANUFACTURING COMPANY
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(*Continued from page 200*)
has an unemployment compensation law. It is significant to note here that the state of Mississippi, which still has no workmen's compensation law, has adopted an unemployment compensation law, but is the only state which does not provide for experience rating.

And so today, in all but this one state of Mississippi, every subject employer has a real incentive to stabilize employment just as he has an incentive to prevent accidents under the workmen's compensation law. One can see, therefore, that in dollars and cents "there is gold in them there peaks and valleys of employment." This is "cold cash" in your pockets. All you have to do is to expend some energy and effort to get it.

There is one point, with respect to experience rating vs. benefit payments, that I would like to make plain for the purpose of the record. Labor and various representatives of the Federal Security Board do not like experience rating provisions in state laws, and have many times and in many ways tried to eliminate these provisions, particularly by trying to federalize the state unemployment compensation system. Thus far, these many attempts have failed. The usual argument advanced is that employers, through the medium of experience rating provisions, are deliberately cutting down the maximum amount of benefits to which an unemployed worker is entitled. Wisconsin employers and employers of other states have given the lie to the charges made that experience rating is a scheme designed to chisel on the unemployed worker. To challenge the statements made by labor and the various representatives of the security board, one need only make an examination of the various state laws to see for himself how the duration and the maximum benefit amount have been liberalized. Some states have gone along with labor's demand of $25 a week for 26 weeks. In the state of Wisconsin we started out paying benefits of $10 a week for 13 weeks. Commencing with Jan. 1, 1948, maximum benefits will be $24 per week for 24 weeks.

Achieve Direct Savings

Now to get back to the subject. These "cold cash" savings are the direct savings that an employer can achieve. There are employers, who thus far, have saved thousands, hundreds of thousands, yes and even millions of dollars by virtue of these provisions. In a tough year, these savings can spell the difference between a profit and a loss. Further, these employers, having achieved at least some degree of stability of employment, are in a better competitive position from a cost angle than those who have paid no attention to the problem, or, if they have considered it, concluded that nothing could be done.

However, in addition to these direct savings, there are indirect savings—those that cannot be segregated accurately without effort, savings which appear intangible, and yet when recognized take on real form of tangibility. Let me ask you a few questions:

1. How much does it cost to hire and train new workers? Consider the cost of pre-employment medical examination alone. There have been various estimates as to what it costs to hire and train a new worker—the cost placed anywhere from $25 to $300 per worker, depending upon the individual's skill and the type of job which he is to perform.

2. What about spoiled work? Was it caused by a new worker? Would it have been prevented by an experi-

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enced company employee?

3. How many of your industrial accidents happen to newer employees? Check yourself on these and see how much it costs.

4. What is your production efficiency? Ask any worker whether he is able to do a better job, if he does not have to worry about how long his job will last. And if you think that a job cannot be made to last longer, just watch a few workers when a temporary job nears the end.

5. What about "idleness expense"? Look at the machinery that is idle during your slack season. Look what profit could be made, if all available capacity were used. While your plant is slowed down because of lack of work, what about the payment of rent, investment in vacant floor space, heat, light, insurance and depreciation, property taxes, repairs and maintenance on idle buildings and office equipment. You pay your plant supervisor even though work is slow, don't you? How about the wages paid to your office force. Look at these idle dollars.

6. Let's not forget the employee. What about him? If he is worried about being laid off because of lack of work, his efficiency falls. You lose. How about this employee's wife and his dependents. They worry too. How about the purchasing power in your community, in your state. No work, no pay—no buying power. No buying power—no business in the community. No business in the community—and before long you're out of business, or at least suffer a severe set-back.

7. What about your labor relations? Could these be improved by a steadier work program?

8. What about labor's demand for a guaranteed annual wage? Probably some of you have already been faced with the demand. Those who know most about such matters are agreed that a guarantee of that type cannot be realized, unless production and employment are stabilized, and when employment is stabilized, a guaranteed annual wage is not needed. How can you combat the demand for a guaranteed annual wage, if you have not studied the stability of your employment and production? If you do not know what your situation in this respect is, how can you meet the charge that you don't care?

There you have it. Eliminate the peaks and valleys in your employment curve, and you have a more self-assured and satisfied employee, better industrial relations, lower unemployment compensation contribution rates and additional profits. What more of an incentive does an employer need to stabilize his employment.

Please do not misunderstand me. I am not saying that one can achieve ultimate perfection in the stabilization of employment. There are too many outside influences to make this possible. Everyone in business concerns himself with business cycles, national economy and its politics and the overall international picture. However, aside from these outside influences, we can and should do everything possible, at least in those things which are within our power and control.

Nor do I say that all those employers who have already realized unemployment compensation rate reductions have been successful in achieving maximum stabilization of employment. However, reduced unemployment compensation rates in some ways do indicate that at least some measure of success is possible.

I do not claim, for example, that Allis-Chalmers Mfg. Co. has succeeded completely in stabilizing employment. However, we have done some

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ASSOCIATE COMPANIES

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things. At one of our farm implement plants we have introduced new products to be manufactured during our slack season, so that today we are able to provide year-round employment for the employees of that plant. Likewise, instead of laying off employees in one division of our plant and hiring in another, we have developed a system of transfers between divisions. We have tried to develop the versatility of workers so that if their jobs peter out, they can be placed elsewhere with equal efficiency. We are watching very closely our sales and production curves and our scheduling, in order to avoid a peak employment and then a drop. Allis-Chalmers is tremendously interested in the problem of stabilization of employment, and its entire managment is working toward that end.

There is an old Chinese proverb that says: "Journey of a thousand miles begins with a step." We at Allis-Chalmers believe that we have taken more than just a step, but a thousand miles is a long ways to go. The task is slow and tedious, but with enough persistence, with constant effort, we can at least try to reach the last step of that thousand miles.

In 1938 and 1939 the National Association of Manufacturers became intensely interested in this program and commenced to stimulate its members to thinking in terms of steadier jobs.

On June 21, 1940, the first Wisconsin Conference on Steadier Jobs was held at Milwaukee. The sponsoring organizations were the Industrial Commission of Wisconsin, the Wisconsin Manufacturers Association, the Wisconsin State Chamber of Commerce, the Wisconsin Department of American Legion, and the Wisconsin State Federation of Labor. At this conference, which was presided over by Voyta Wrabetz, chairman of the Wisconsin Industrial Commission, appeared Dr. Emerson P. Schmidt, consulting economist of the American Legion Stabilization Service, now research director at the United States Chamber of Commerce, and a large number of representatives of industry, in order to tell those present what they themselves have found and done to stabilize employment—what steps were taken initially—and what success was realized.

Establish Program of Steady Jobs

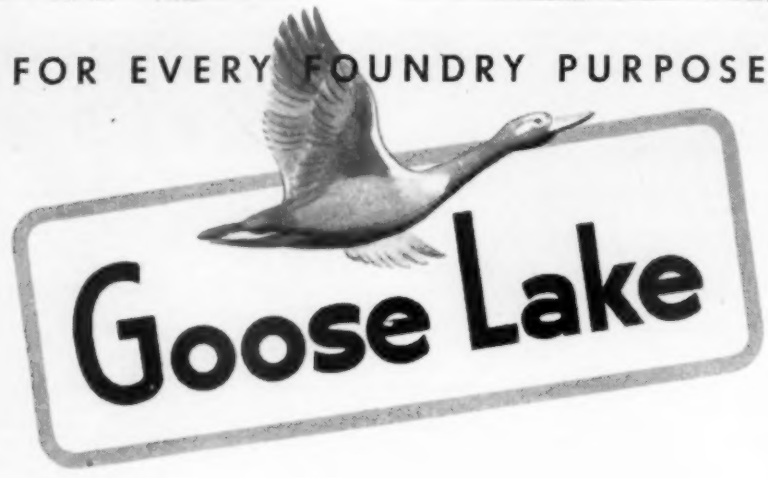
The purpose of this conference was to stimulate interest among employers in establishing a program of steadier jobs. Dr. Schmidt has studied hundreds of cases of individual industries and employer activity in this field and has published them. The booklet is entitled "To Make Jobs More Steady and To Make More Steady Jobs." From this conference it was apparent that each specific industry had its own specific problem, and that one device which worked in one industry could not work in another. In other words, employers were impressed with the idea that they must study their own particular industry, its own specific problems and devise its own specific means.

However, with the impact of the war, with conversion problems, with plenty of orders, and with the shortage of help, the interest of most employers in this program dwindled or ceased entirely. And necessarily so, because employers had a production problem on their hands. They had to get the stuff out as quickly as possible and get it there on time.

With the cessation of hostilities and the problems of reconversion to peacetime production; with the pub-

(*Continued on page* 206)

FOR EVERY FOUNDRY PURPOSE



FIRE CLAYS

The most widely used of all fire clays in midwest foundries. They supply every bond and refractory requirement. These clays are prepared in a large, modern grinding plant, which for 32 years has served the foundry industry with prompt and dependable shipments.

Valuable consultation is available with experienced engineers for the best use of fire clays in foundry bond and refractory service. They often supply important help for the reduction of foundry scrap losses.

A new booklet with many pictures about the production of Goose Lake Fire Clays is available upon request. Write now for your copy.

Make "your" next car of fire clay GOOSE LAKE

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FIRE CLAY · CLAY BOND · BRICK · BLOCK

JOLIET, ILLINOIS

Break your Core-Baking BOTTLENECK with Truline Binder

Slow-baking core oil needn't cut down your castings output. You can replace some core oil with Truline Binder and speed up baking time because Truline accelerates the oxidation of the core oil. With Truline, you get:

1. FASTER BAKING—

In batch ovens, you can save as much as 25% baking time.

In tower ovens, you can frequently eliminate an extra trip through.

2. MORE UNIFORM BAKING—

The inside and plate sides of Truline cores will be baked more thoroughly—especially on *large* cores where better baking *really* counts!

Remember — thoroughly baked cores mean less gas at pouring time.

We have an easy, fact-finding procedure that can tell you the extent to which you can profitably replace core oil with Truline Binder. Mail the coupon below and we'll send the information along.

HERCULES

TRULINE BINDER

REG. U. S. PAT. OFF.

HERCULES POWDER COMPANY

920 King Street, Wilmington 99, Delaware

Please send information about profitably replacing core oil with Truline Binder.

Name.....

Company.....

Type of Castings.....

Street.....

City.....Zone.....State.....

NPB-1

(*Continued from page* 204)

lic demand so heavy and with more orders than can be filled, many employers are still concerned only with the problem of production—get it out. However, it is at the point that supply meets demand that industry will be in trouble. Unless, therefore, industry begins to pay attention to the problem of stabilization of employment *now*, it may be too late to do anything about it when supply does meet demand.

Recognizing this, the National Assocation of Manufacturers, in co-operation with the National Industrial Council has undertaken a tremendous program to re-stimulate its own members. Other employer organizations are doing likewise. Industry must do something in this field. The public is looking to industry to provide steadier jobs. Failure and a resulting depression may spell the end of private enterprise. Communist Russia is waiting for just this very thing to happen. What a fertile field for activity on their part! Union-sponsored guaranteed annual wage demands make it imperative for employers to know their own employment stability in order to counter-union arguments. Government-sponsored studies, such as the Latimer report, indicate the need for management action on this problem.

Furthermore, the problem of providing steadier jobs cannot be solved by calling your foremen, telling them of the advantages of stabilization of employment and then ordering them to do something about it. Stabilization of employment is top management's job. It must do the thinking, it must direct, it must educate its supervisory force and it must see to it that its orders in this connection are followed through. Many companies have formulated a top management committee, consisting of representatives of sales, manufacturing, accounting and industrial relations divisions. Usually, economists and technicians are employed to perform surveys for this top management committee.

Business Fluctuates With Orders

And now what about your own industry—the gray iron foundry industry. I realize that your industry is not an end-product industry; that you must for the most part rely upon indeterminate orders. I suppose that the simplest way out to solve this problem would be for you to say, "You stabilize our orders and we will stabilize our business." But isn't that putting the cart before the horse? It is true that you people are for the most part jobbers and that your business does fluctuate with orders, but there certainly must be some things *under your control which you can do.*

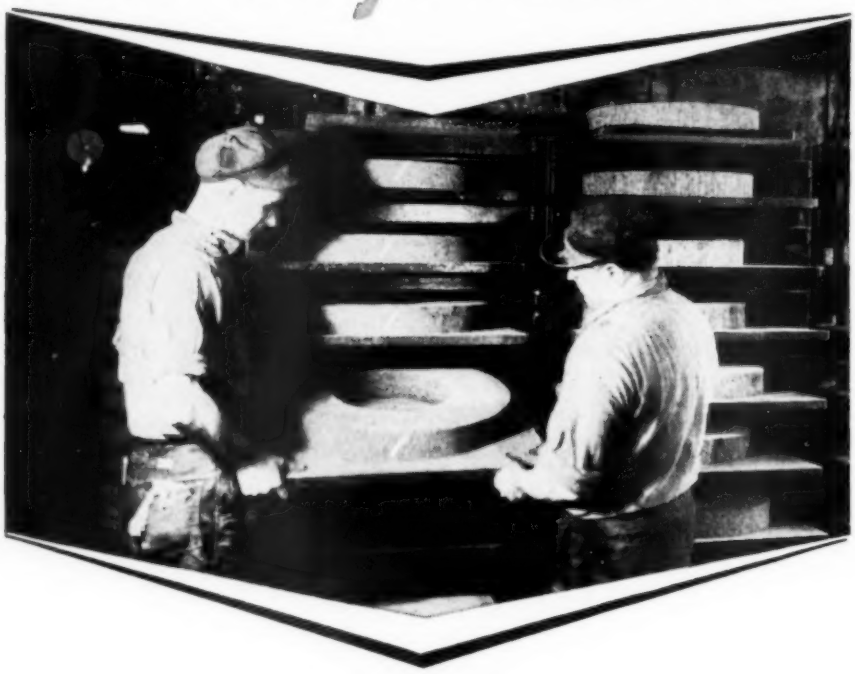
As an example of what has been done by one foundry, I shall cite case number 57 of the American Legion Employment Stabilization Service. Ninety-five per cent of the total sales of this company consists of goods manufactured to customer's specifications which change frequently as the customer redesigns his finished products.

The labor costs of this company average approximately 50 per cent of the selling price of the products, and the company had long been aware of an increase in this cost toward the end of the busy season due to stretching out of the work by the men. Realizing that those increased costs could be held down if the men had no need to worry about a layoff, this company proceeded with a study of stabilization.

First, management made an exhaustive investigation of the economies achieved by runs of various

(*Continued on page* 208)

"I do the job faster..."



Transite Core Plates offer all these advantages:

They speed production—Core makers save trips . . . handle many plates at one time.

They last longer—Made of fibrous asbestos and cement, Transite Core Plates resist shock . . . are less likely to crack or break.

They clean easily—Core wash, sand, etc., do not stick as readily as to other materials. Both sides are usable.

They resist corrosion and warpage—Transite Core Plate surfaces stay smooth even after long service. Warpage is less than 0.1%.

They are economical—Low price, low maintenance and long life add up to low costs.

To eliminate green cores and reduce baking time perforated plates are also available.

JM

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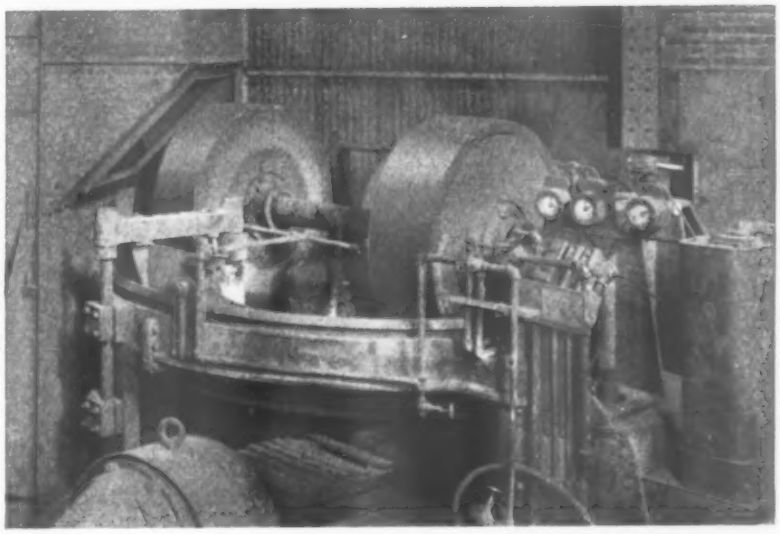
TRANSITE CORE PLATES MADE OF ASBESTOS

Lower your production costs...

by maintaining
Heap Sand

Grey iron-molding sand kept in condition by a Clearfield 610 Mixer.



A 920 Clearfield on core sand in a mid-western steel foundry.

the Clearfield Mixer

You can pile up substantial savings and acquire constant control of quality at a minimum cost by maintaining your heap sand with a Clearfield Mixer. With a Clearfield Mixer you can continue the use of old sand almost indefinitely with only the addition of a little new to replace losses—and be constantly sure that your molding sand is just how you want it. Clearfield Mixers are manufactured in a variety of models and sizes. Write today for complete information.

CLEARFIELD MIXER
MIXES, TEMPERS, AERATES

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

(*Continued from page* 206)

sizes in typical classes of product, and on the basis of this investigation set up a scale of quantity discounts, so that these actually gave the customer the entire benefit of factory savings on big orders. Analysis of customers' orders disclosed that 65 per cent of the customers usually place their orders for only a month's supply in advance and, of course, demanded immediate delivery. The salesmen were instructed to try to obtain orders for several months in advance, and in those cases where the product was staple, a full year in advance. With larger orders, the work of the foundry could be better scheduled, and jobs received from those customers who could not, or would not order in advance, were sandwiched in.

Second, the company is attempting to develop new products of standard design and staple customers' item, which can be manufactured in advance of requirement. These products are manufactured in slack time and stored if necessary for sale at some later date. Since these items usually have a fall and winter peak demand, a special discount of 3 per cent is given to customers who purchase these goods out of season. These staple items now constitute 5 per cent of the total volume of business, and it is hoped that these will eventually account for 30 per cent of the company's sales.

Third, a big buyer who had been spreading his orders among several foundries was approached with a proposition that if he would give this company all of his business, with a five-year contract, guaranteeing a stipulated annual minimum, the product would be sold to him at cost. This business, which amounts to only 2½ per cent of the total annual sales does not materially affect the profits of the company, but its stabilizing influence is felt throughout the year.

Reduce Labor Turnover

Training has made the foremen "lay-off conscious," and each week the management circulates among the foremen a graphic record of transfers and layoffs by departments. In consequence, the foremen have devised several methods to reduce the labor turnover. Men are trained for maximum versatility and transferred among departments to gain greater skill.

At the outset of this stabilization program, this company was paying the maximum unemployment compensation rate of 4 per cent. This rate has now been reduced to 2.7 per cent with every indication that it will be still further reduced to the minimum of 0 per cent in the near future. The savings already effected, 1.3 per cent of the payroll, is in itself equal to 0.5 per cent of the total annual gross sales. However, this is only one of the advantages that has been gained. During this period the plant's production per man-hour has increased 15 per cent. While it is true that two-thirds of this increase is due to the introduction of labor-saving equipment, one-third can only be attributed to greater skill on the part of the men and the increased will to work arising from steady employment. These savings in the cost of production are equivalent to 2.5 per cent of total sales.

Through its stabilization program this company has bettered industrial relations in its plants, increased the efficiency of its employees, improved its product and, though the volume of total sales has remained the same, the net profit of the company has increased 3 per cent.

In preparing this paper I performed a little survey work. I wanted to

(*Continued on page* 210)

...Introducing

A REVOLUTIONARY NEW

"CAST-MASTER"

Die Casting Machine

Model No. 40

Turns out Castings up to 5 lbs.

...10% to 50% FASTER!

A "natural" for shops doing small or medium castings or shops needing a supplementary machine to handle smaller dies

A die-casting machine, designed by leading die-casting engineers, to produce light and medium castings at a rate of speed and efficiency heretofore considered impossible. Precision-built, it offers the same rigidity, the same superior construction as other famous Cast-master models . . . plus added exclusive features that speed up production and cut operating costs to a NEW LOW.

Catalog and Specification Sheet available on request

MILLER•TAYLOR TOOL CO.

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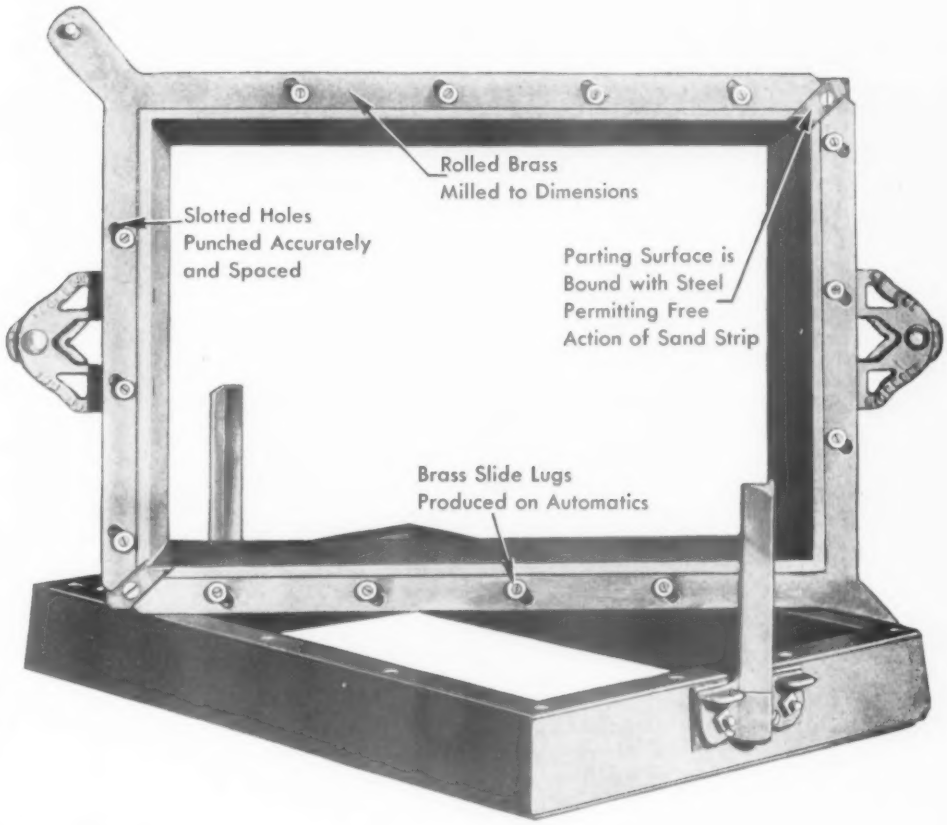
Now » » a BIG improvement in foundry flasks!

DIAMOND introduces Precision-made, 100% machined sand strips.



PROMPT DELIVERY

** Increased production facilities, ample supplies of materials permit us to give prompt delivery.*

Write for

BULLETIN "F"

for complete details on this outstanding new line of fine foundry flasks.

DIAMOND

Telephone 2553 CLAMP AND FLASK COMPANY Richmond, Indiana

Designers of CORE PLATES, JACKETS, BANDS, FLASKS since 1889

(*Continued from page* 208)

find out what efforts the gray iron foundry industry, or for that matter the entire foundry industry, has expended to stabilize employment. To my surprise I found:

1. That foundry operators have paid no attention to steadier jobs, principally because they are unaware of the advantages to be gained and devices to be used in regularizing employment, or

2. That some foundry operators had considered the matter but concluded that the task was impossible and dropped it after only a short trial.

I tried to discover the underlying reason for this apathy. I am not sure that I have found the right answer, but I do think I have an answer.

Statistics show that there are 5452 foundries in the United States. Of this number 3058 foundries make gray iron castings. The breakdown by size is as follows:

Over 1,000 employees	. .	26 foundries
500-1,000 employees	. . . .	55 foundries
250- 500 employees	. . . .	186 foundries
100- 250 employees	. . .	542 foundries
50- 100 employees	. . . .	710 foundries
25- 50 employees	. . . .	651 foundries
10- 25 employees	. . . .	888 foundries

These figures show that out of 3058 gray iron foundries in the United States, 2791 foundries have less than 250 employees. In other words, 91 per cent of the foundry business is small business. Obviously, a small businessman cannot afford to employ economists and technicians to develop a steadier job program for him. Foundry businessmen have their hands full soliciting orders, maintaining production and trying to make ends meet.

About four months ago, in connection with the stabilization of employment program sponsored by the National Association of Manufacturers I took part in clinics held in eight different cities in Michigan. At these clinics, representatives from 15 to 25 companies of the locality, in which we were appearing, were present. After a lengthy discussion, pointing out the advantages of stabilized employment, and after having seen that sufficient interest in the subject was stimulated, these groups were asked and did later formulate stabilization of employment committees within their locality. These groups hold meetings periodically to exchange ideas. They then take their ideas back to their own plant and test them out. Similar clinics were held in six different localities in Minnesota and thus far two localities in the state of Wisconsin. It is NAM's program to formulate approximately 250 of these committees throughout the United States within the next year.

Present General Information

Space limitations prevent giving more than general information. There are books, pamphlets and speeches setting forth the details on this matter. However, I have these recommendations to make:

1. Since the foundry business is a small business, and since the small businessman cannot employ economists and technicians to perform this job for him, your association should be directed to perform these surveys, obtain material and disseminate the same to you.

2. After obtaining the results of work performed by your association, formulate small committees in your own locality, irrespective of whether it be on a city or a county basis, in order to exchange ideas and test them out. In this way you will be educating yourselves and others to accomplish what we must accomplish, namely, a steady job for every man who wants to work.

(*Concluded on page* 212)

NEW DIRECT V-BELT DRIVE MAKES SPEED-CHANGING FAST With WADSWORTH WECO NO. 3 CORE MACHINE

Cut costs—get increased core production—save man hours—floor space. Design improvements incorporated in the New Wadsworth No. 3 Core Maker makes speed-changing faster, requires less time per core. Simplicity of construction cuts maintenance. Protected lubrication, automatic overload control, dust-proof mechanism throughout insures safe, long-time operation. The Wadsworth No. 3 is custom-built to specifications best suited to your job requirements. Write us for complete information and data.

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Stock Core Machines * Cutting Off and Coning Machines * Steel Core Plates * Steel and Aluminum Bottom Plates * Core Files * Square Twisted Steel Gaggers * Aluminum Slip Flasks * Aluminum Flexible Jackets * Metal Patterns * Aluminum Match Plates * Permanent Molds * Sand Cores From Your Core Boxes * Cores Shipped Anywhere—Send Us Your Core Boxes

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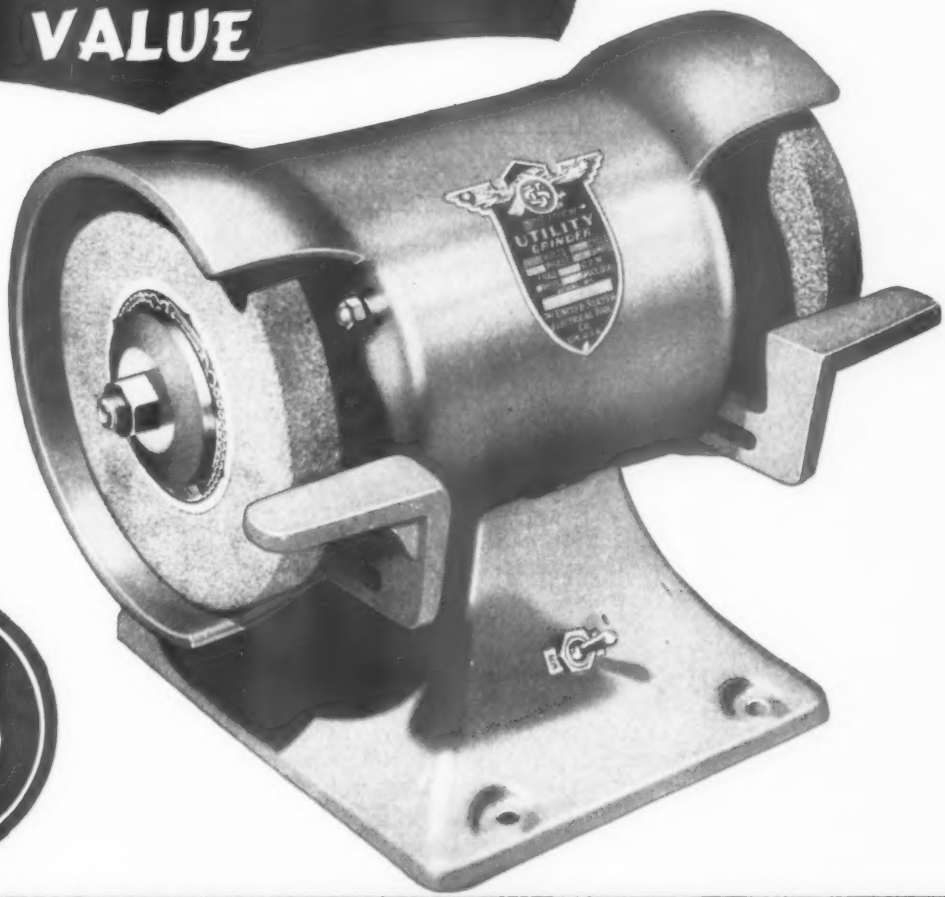
AMERICA'S GREATEST GRINDER VALUE



UNITED STATES 6-INCH UTILITY BENCH GRINDER

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For shops, garages, farms, home workshops and general industrial uses.

Compact . . . powerful . . . precision-engineered . . . precision-built. For grinding all types of edge tools and general purpose grinding . . . buffing . . . wire brushing . . . polishing. Sturdy construction . . . well balanced.

MOTOR: 1/3 hp, 3450 rpm, permanent split capacitor totally enclosed ball-bearing motor. WHEELS: 6" x 3/4" x 1/2"; one coarse and one fine. TOOL RESTS adjustable to wheel wear. Heavy duty double pole switch in base.

REDDY for

· tool grinding · buffing · wire brushing · polishing · general purpose grinding

CONTACT YOUR DISTRIBUTOR OR WRITE DIRECT

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

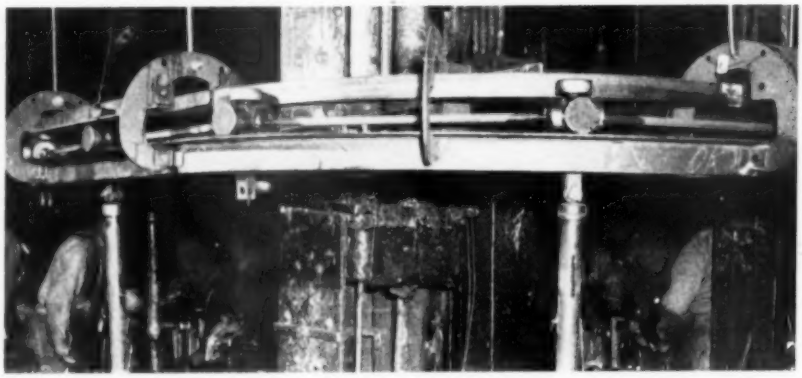
(*Concluded from page* 210)

All industry must recognize the responsibility that it owes to the American public. The resulting stabilization of employment will give the greatest possible assurance of sound and lasting prosperity, which is the desire of every individual. American management has already overwhelmed its best friends and severest critics by providing full employment at high wages, unequaled in history.

However, American manufacturers have never rested on past attainments, hanging up new records—one after another—has been the very essence of our progress.

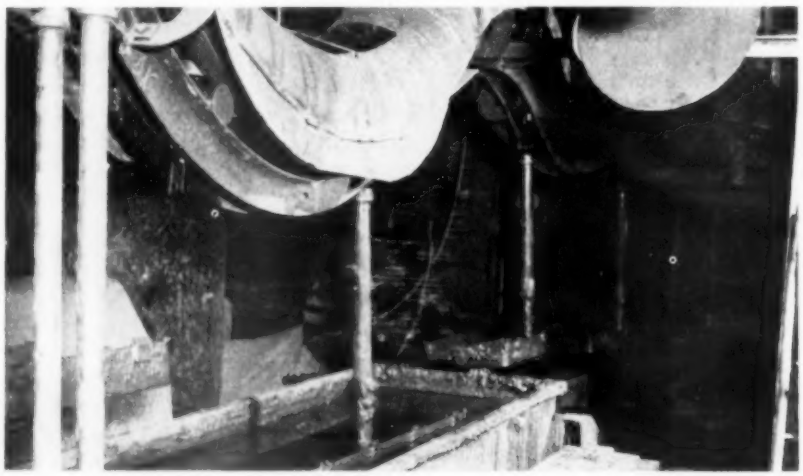
Let us embark, therefore, on this employment stabilization program, remembering, however, the old Chinese proverb, "A journey of a thousand miles begins with a step."

Conveyor Negotiates Sharp Curves



ACCOMPANYING illustrations show a foundry application of an overhead conveyor which is capable of negotiating unusually sharp horizontal and vertical curves. In this instance it is used in the coreroom of the Ford Motor Co.'s Rouge foundry to carry cores through a plumbago dip tank, then on to drying ovens. The conveyor, a product of Taylor & Gaskin Inc., 3105 Beaufait Ave., Detroit 7, replaced a mechanical device which was used to raise and lower the core wash tank as the conveyor load passed on a level plane. The view below shows how the new conveyor dips in and out of the tank on a 30-in. radius, reducing the overall length of the conveyor considerably compared with the former installation. Radius of vertical curves with this type conveyor can be as small as 9 in., according to the manufacturer; the standard is 24 to 36 in.

The upper view of the same installation shows how this conveyor operates around a typical 90-degree horizontal curve. It also illustrates the principal components of the unit—two ball and socket joints equipped with vertical and horizontal axle wheels. Trolleys are spaced 24 to 36 in. apart by rods. Ball and socket joints are lubricated by sealed-in grease. Vertical axle wheels are idle except at horizontal turns. Take-up is accomplished by telescoping the rods ½-in. each end in the trolley. Individual trolley load capacity ranges up to 200 lb, with 2000-lb rod pull.



Metal Trades Group In Annual Meeting

Industrial management is talking things over with employees—giving it the facts of business—more than ever before. This was revealed at the 48th annual convention of the National Metal Trades Association at the Palmer House, Chicago, Nov. 5 to 7, attended by 750 key executives representing manufacturing plants throughout the eastern half of the United States.

Theme of the convention was "Sound Industrial Relations for the Job Ahead." In the discussions of current industrial relations problems, it was evident that passage of the Taft-Hartley Act has paved the way for more extensive communications between employers and employees. Two ways of accomplishing this are gaining ground—talks by company heads to large groups of workers, and letters mailed directly to employees' homes.

Advocates Close Relations

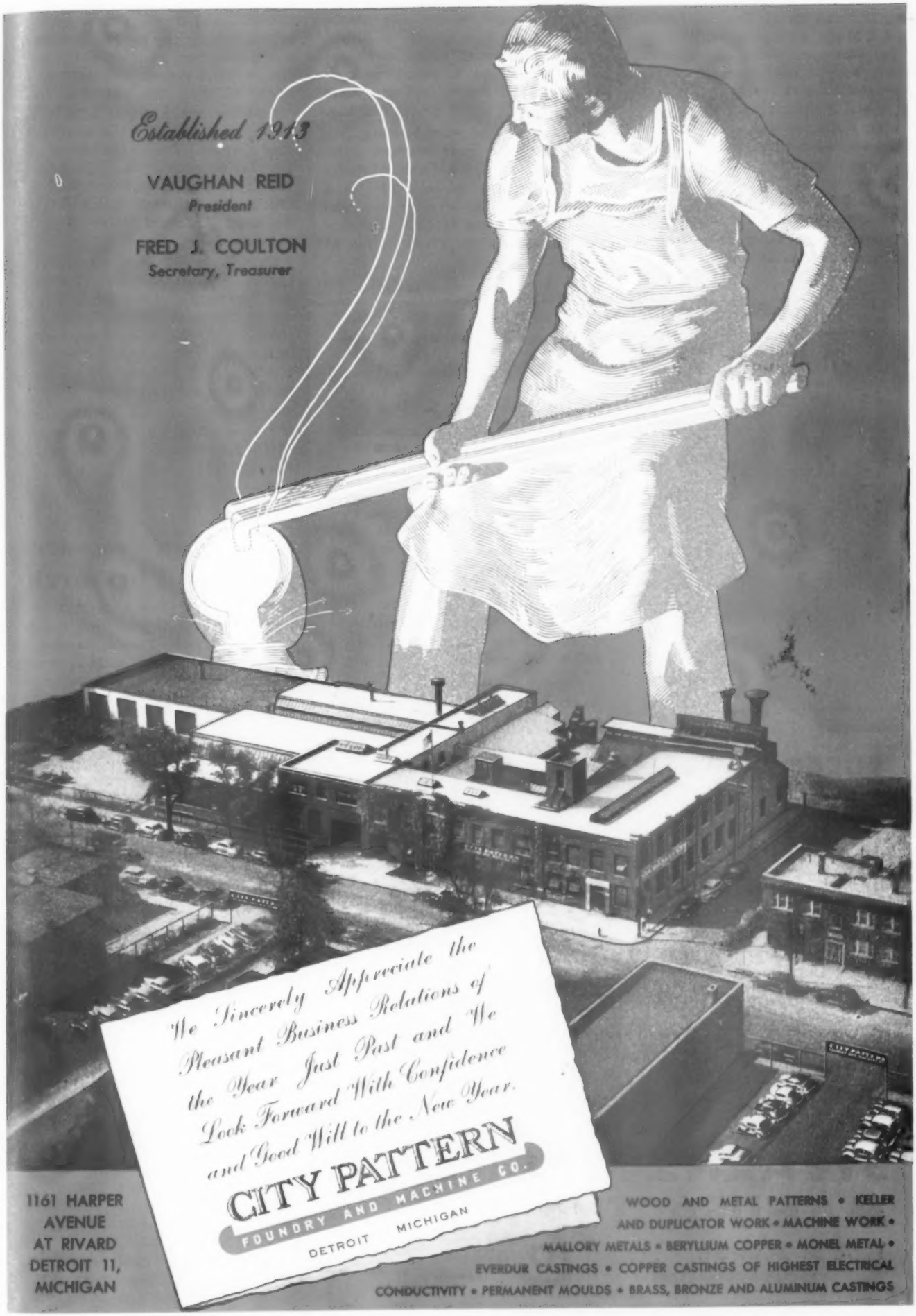
Specialists in the field have grown more emphatic in their recommendations that a good industrial relations policy has become a necessity of company existence. One of the major points of such a policy is telling employees—and especially supervisors and foremen—what is going on in the company.

Howard Goodman, vice president, Goodman Mfg. Co., Chicago, was re-elected president of the association to serve a second term. Also re-elected were First Vice President T. J. Morton Jr., president, Hoosier Cardinal Corp., Evansville, Ind.; and Second Vice President and Treasurer Joseph L. Kopf, president, Jabez Burns & Sons Inc., New York.

Thirteen councilors were elected for two years, four of these being new and nine being returned to office. The new are Joseph W. Crook, Grinnell Corp., Cranston, R. I.; Robert Hess, Washburn Co., Worcester, Mass.; Russell C. Ball, Philadelphia Gear Works Inc., Philadelphia; and William L. Dolle, Lodge & Shipley Co., Cincinnati.

Councilors re-elected were: Howard A. Lincoln, Bemis & Call Co., Springfield, Mass.; H. Paul Nelligan, Easy Washing Machine Corp., Syracuse, N. Y.; R. A. Mitchell, Pittsburgh Forgings Co., Coraopolis, Pa.; Adrian Collins, Jarecki Mfg. Co., Erie, Pa.; J. I. Schultz, National Broach & Machine Co., Detroit; E. L. Usner, Ross Gear & Tool Co., Lafayette, Ind.; C. R. Rosborough, Moline Tool Co., Mo-

(*Concluded on page* 214)


Established 1913
VAUGHAN REID
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FRED J. COULTON
Secretary, Treasurer
We Sincerely Appreciate the Pleasant Business Relations of the Year Just Past and We Look Forward With Confidence and Good Will to the New Year.
CITY PATTERN
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(*Concluded from page* 212)

line, Ill.; and M. E. Erskine, Racine Tool & Machine Co., Racine, Wis.

Postwar problems of industry, which have brought economic disorganization and scarcity, inflation of costs, impairment of savings, human bitterness and bewilderment, were appraised as an exciting challenge and opportunity by Frederick V. Geier, president, Cincinnati Milling Machine Co., Cincinnati, in an address titled "America Unfinished."

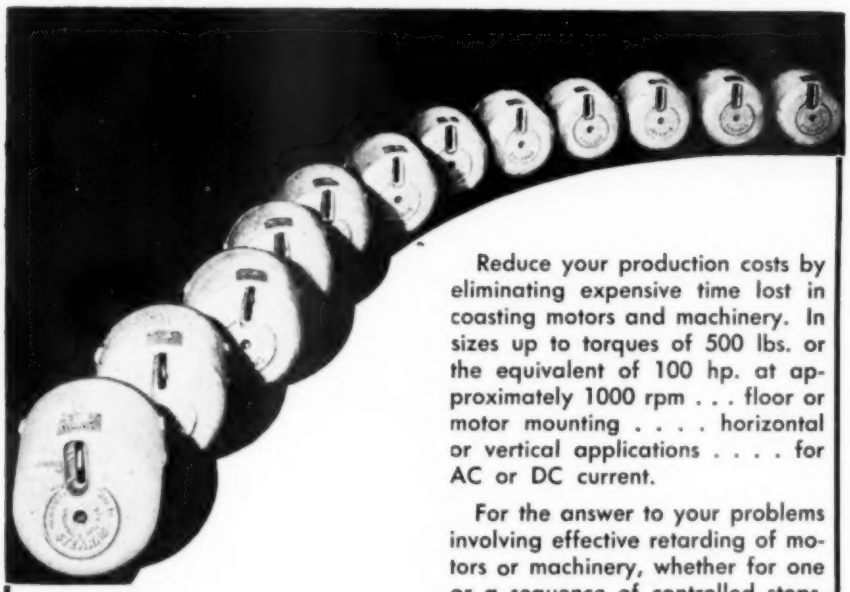
Currently, Mr. Geier continued, we confront the greatest obstacle of all—the high cost of everything. The question of production costs is fundamental to solution of our problems. Management must exert every resource and effort to rebuild productivity of employees to get unit costs down to levels where people can buy.

"Unless we find ways to bring this about," Mr. Geier warned, "the goods produced will become too costly for the workers to buy. This is a supreme challenge to everyone who has the well being of his fellow employees and of the whole nation at heart."

One feature of the convention was a testimonial dinner on the evening of the opening day for 283 companies which have been members of the association for a quarter of a century or more. Heading the list were four companies which have been members since 1899, when the association was formed. These companies are Barbour-Stockwell Co., Cambridge, Mass.; Cincinnati Bickford Tool Co., Cincinnati; Benjamin Eastwood Co., Paterson, N. J.; and Jeffery Mfg. Co., Columbus, O.

Capt. Richard J. H. Conn, officer in charge of industrial mobilization planning, Bureau of Aeronautics, United States Navy, Washington, addressed the annual dinner on "Aeronautics Industrial Mobilization Planning." This was first disclosure of the plans to industry as a whole.

Forty-ninth annual convention of the association will be held at the Waldorf-Astoria, New York, in November, 1948.



Reduce your production costs by eliminating expensive time lost in coasting motors and machinery. In sizes up to torques of 500 lbs. or the equivalent of 100 hp. at approximately 1000 rpm . . . floor or motor mounting . . . . horizontal or vertical applications . . . . for AC or DC current.

For the answer to your problems involving effective retarding of motors or machinery, whether for one or a sequence of controlled stops, consult Stearns Magnetic Brake Division, Milwaukee 4, Wis.

Ask for Bulletin 604-E.

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The magnetic brake with the lining wear indicator and manual release — distinctive, original.

STEARNS MAGNETIC MANUFACTURING CO.

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PULLEYS—SEPARATORS—CLUTCHES—DRUMS—MAGNETS

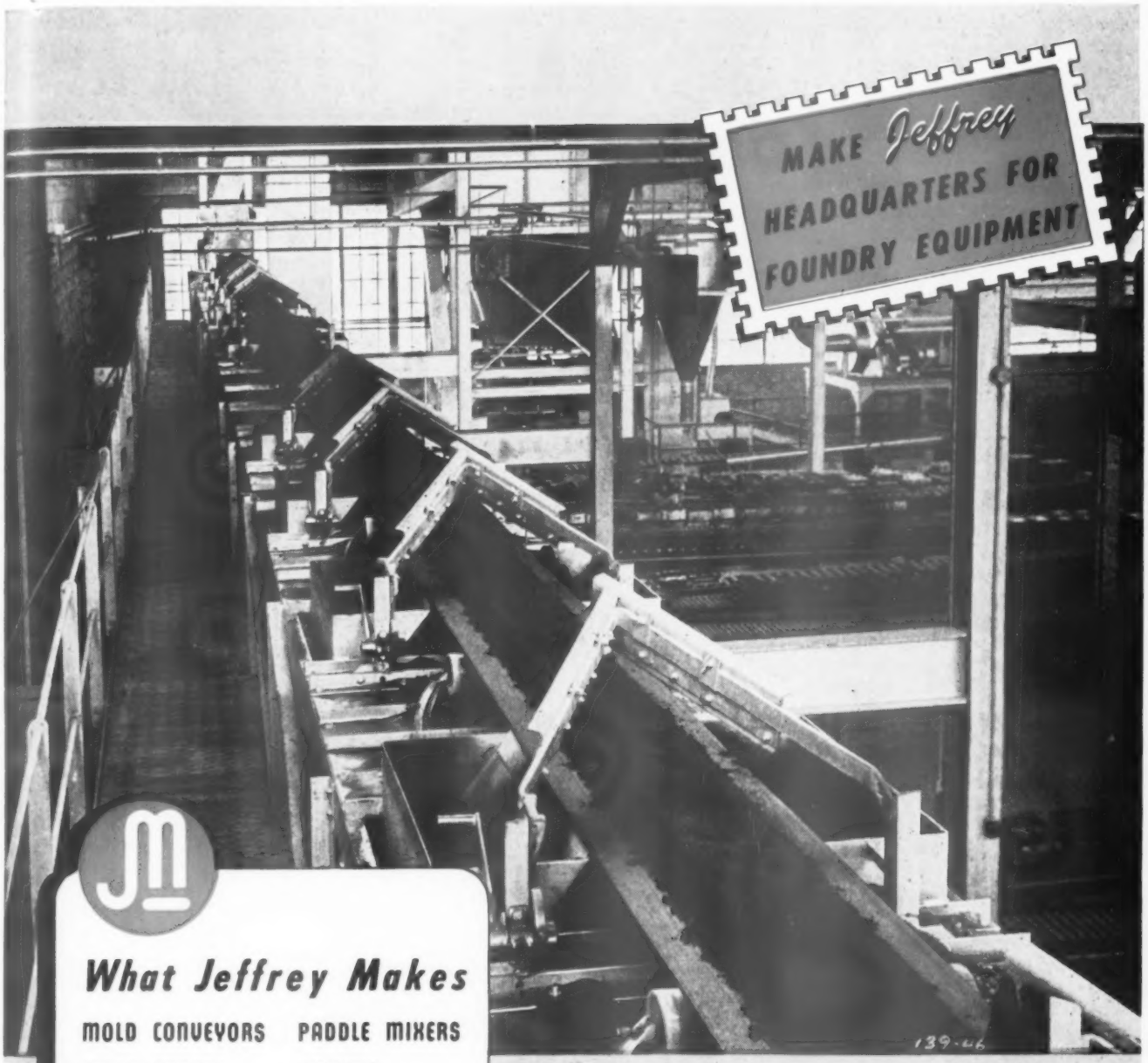
Gray Iron Founders Meet at Pittsburgh

The Gray Iron Founders' Society held a meeting of gray iron foundry executives in the Pittsburgh area on Nov. 20. Robert G. Schaefer, society director and board chairman of Schaefer-Goodnow Foundries, Inc., presided.

At the meeting, first of a series of 40 to be conducted throughout the United States for the purpose of organizing local society groups of executives, Mr. Schaefer was elected chairman for the ensuing year and W. H. Watts, president, Columbia Radiator Co., was named vice chairman.

R. L. Collier, executive vice president, Gray Iron Founders' Society, stressed the prospect of pig iron scarcity in the industry this winter and next year. "Many blast furnaces are scheduled to be taken out of blast for much-needed repairs and relining during the coming year," he said, and suggested a voluntary arrangement among producers to serve foundries during periods when they are unable to obtain pig iron from their regular sources of supply due to furnaces being down for repairs.

Mr. Collier also expressed the view that Europe probably has all the ferrous scrap it needs without aid of the Marshall Plan, and suggested that exports of finished and semi-finished iron and steel products under the plan be offset by scrap shipments from Europe to this country.



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A large Sand Handling installation in a modern brass foundry showing finished sand bucket elevator and distributing belt conveyor.

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Complete Line of Material Handling, Processing and Mining Equipment

DESIGNS SMALL CUPOLA

for Fast Melting

By V. V. ROGERS
Hercus Mfg. Co.
Southwark, South Australia

THE greatest quantity of hot iron in the shortest space of time, at the lowest possible cost—these are the three controlling factors when designing and constructing a cupola to allow air, iron and fuel to be used in proper proportions.

According to theory, a cupola having an inside diameter of 24 in., should melt approximately 4000 lb per hour. Very often where this result is obtained, the cupola is working at full capacity, and no attempt is made to increase the output. Other cupolas in actual practice melt considerably less, while the fuel consumption is much higher per ton of iron melted. Excessive damage to the lining, continual hanging up due to bridges forming above the tuyeres, are all faults capable of being overcome without any great difficulty, if proper care is taken in design, construction and preparation prior to the melt, and in operation of the cupola generally.

The cupola shown in the accompanying illustration is designed to carry approximately 2800 lb when loaded to the charging door. Height from the sand bed to the charging door is 11 ft 6 in. Some foundrymen question whether this height has any appreciable advantage over one 3 or 4 ft lower. I maintain that it has. Instead of wasting heat by blowing it through the stack, every degree is utilized in preheating the iron. Obviously this reduces the quantity of coke necessary to melt a given amount of iron. A cupola can be overloaded, unless proper air adjustments are made, and this extra air can cause a certain amount of trouble toward the end when the load is getting lighter.

The height as given, together with the quantity of air, has proved ideal. No serious defects have been found in the cupola, and no spongy castings produced as the result of burned iron caused by too much air forced into the cupola. Too much air is as detrimental as too little. It is not always realized that the heavier the load the greater the resistance against the air entering through the tuyeres. The same pressure used in a cupola, say 7 ft 6 in. high, is not nearly so effective in one that may be 11 ft high.

Principal causes of bad melting usually are attributed to the wrong quantity and delivery of the blast. This is true up to a certain point, but there are other causes which will be dealt with later.

Too much reliance is placed upon air pressure in the wind pipe. One hears of cupolas not giving satisfactory results, yet the air pressure is so many ounces. This means nothing; it is the volume that counts. The chief difficulty is to arrive at the correct quantity of air, which, when combined with a certain quantity of coke, will give a satisfactory melt. Certain formulas are given to ascertain this, and it is not my intention to dispute them. However, the main thing to consider is the way the air is distributed inside the cupola.

Compare the effects of 9-oz pressure where the air is distributed from a wind box of proper dimensions, with the same blown direct through the tuyeres into the cupola. An apparent difference will be found not only in the quality of the metal, but in fuel consumption and in the wear and tear on the walls of the cupola. Here is where the pressure fallacy breaks down. I arrive at this conclusion after experience with both types using the same pressure. After comparing my experience with others and from the acclamation of interested foundry men, I should recommend a blast system similar to the one in use on the cupola and as shown in the drawing.

A blower at 3000 rpm, situated about 12 ft from the cupola, forces the air through an 8-in. pipe into a wind box 15 in. high by 12 in. wide. Bottom of the wind box is about 3 ft above the bottom of the cupola. Pressure from the pipe into the wind box is 9 oz. From the wind box the air is distributed to six tuyeres, three 14 and three 18 in. above the sand bed. Tuyeres measure inside 4 x 6 in. tapered back to 4 x 4 in. outside. Instead of the air being forced into the cupola at high pressure, it is broken down just sufficiently to force the air into the center of the cupola. Providing care is taken in allowing for resistance and leakage, the volume created should give the desired results. Charge of 886 lb can be melted without difficulty with this blast; but it is more economical to use lighter charges.

A butterfly shutter in each tuyere plays a very important part. No cupola is complete without them. Looking into the tuyeres on some cupolas, one often wonders how enough air gets inside to melt the iron. The tuyeres are choked or dull. Slag hanging over them impedes the progress of the air to the center, and forces it up along the walls of the cupola. By closing the shutters at intervals the tuyeres are kept bright and clean, allowing the air a continual free passage. The effect is seen in the quality of the metal.

The slag hole should be about 2 in. in diameter and, especially where the metal is drawn off at short intervals, never should be more than 8 or 9 in. above the sand bed, to allow a continual flow of slag. If higher, the slag seldom will reach it and will find its way out through the tap hole, or hang to the walls of the well. If it is necessary to draw off larger quantities, the slag hole easily can be closed. The slag hole never should be too close to a tuyere. If it is, the slag will freeze and choke the hole. The well in cupola shown holds from 750 to 800 lb of metal when full, and with the slag hole closed.

A tap hole built into the lining is preferable to one built up with the breast. It should be 4 or 5 in. across, outside, and tapered off to about 1½ in. This allows the tapper to keep it free from slag, etc., and to be certain that the hole is closed right in against the metal, otherwise the metal in the hole is likely to chill and

cause considerable trouble to remove it.

A drop bottom should be easy to close before, and easy to drop at the conclusion of a heat. A bottom door made in two pieces has an advantage over a one-piece, especially if of steel. The one-piece door, when dropped, is practically buried in burning coke, etc., and soon becomes twisted and buckled, and consequently is hard to close up to the bottom of the cupola.

Too much time often is taken in bricking up a cupola, chiefly through the use of small bricks. In the opinion of some men small bricks are easier to handle. If the melting zone burns out more in one place than another, a brick or two can be knocked out, and replaced without much trouble. Where the air is properly distributed in the cupola, the melting zone should burn back evenly. The foundryman who persists with inferior quality, or small bricks, practices false economy. The bricks used in this particular 24-in. cupola are shaped, and only eight bricks are necessary to make a complete circle 9 in. high. The time saved in building is considerable. Very little clay is needed, just enough to run in to fill the joints.

Several Details Are Essential

Some of the things mentioned may appear to be only minor details. They are absolutely essential if the best is to be had of a cupola in continual use day after day.

Having followed a certain theory in the construction of the cupola, and convinced that the blast is all that is necessary, the foundryman might be tempted to believe that the stage is set for a first-class performance. Many times he has been sadly disillusioned. Not until several heats have been made can he form any definite conclusion as to whether the whole thing is functioning satisfactorily, and if not, what is the cause.

Often the quantity of air is blamed if the melting is slow, or the iron dull, whereas the coke and iron charges are at fault, or it may be vice versa. Whatever it is, only by careful observation and experimenting can the fault be located.

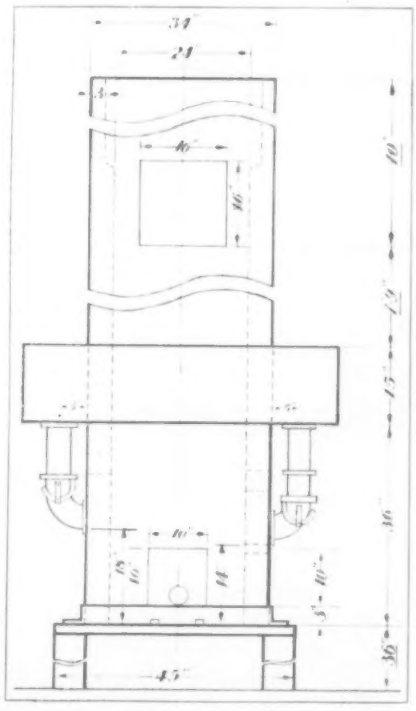
The cupola is the heart of the foundry but, like any other heart, it needs proper attention to function as it should and give the best results. In operating a cupola of the type shown I suggest the following procedure from the first heat until efficiency is obtained; that is, until the greatest quantity of iron is melted in the shortest space of time at the lowest possible cost.

Some probably will disagree with certain of my suggestions. From my own experience, I admit they are entitled to do so. Every cupola has its own peculiarities, and none but the man operating a particular cupola knows them.

A sand bed having only a slight slope to the tapping hole should not be unnecessarily deep, nor should it be rammed too hard, for, apart from a tendency to dull the metal, it probably will hang up after the bottom is dropped, necessitating considerable poking to release it.

Establishment of the melting zone is of the utmost importance. There is only one place in a cupola where the metal will melt properly and that is at a certain height above the tuyeres, where the union of carbon with a sufficient quantity of oxygen creates the greatest heat. To obtain the maximum benefit from this heat, the iron to be melted should be as close as possible to the area where the union takes place. This area in the cupola, as practically every operator knows, is the melting zone.

Certain formulas have been developed to determine the quantity of coke necessary to establish the melting zone. They may apply in certain types of cupolas. With so many cupolas of similar construction and dimensions, each with a different melting capacity, I consider that the surest method of finding the correct place, and the quantity of coke necessary, is by careful experimenting, and not calculation alone.



Cupola is equipped with wind belt and six pendent tuyeres in staggered formation

Assuming, according to calculation, that the melting zone would be about 22 to 24 in. above the tuyeres, build the coke bed up to about 26 or 28 in. If the iron charges are to be 600 lb, reduce to 450 or 500 lb. Place enough coke on top of the bed to melt the iron charge, about 11 or 12 lb to every 100 lb of iron. Follow this procedure throughout the heat.

Note the time the first molten metal begins to flow after the blast is put on. If more than 7 or 8 minutes, the bed is too high. If less time, it is probably too low. Watch carefully the quality of the metal as it flows into the ladle. It is not very difficult to judge approximate temperature by the color.

Examination of the cupola after a heat will show fairly accurately just where the melting zone is located. The coke bed can be adjusted accordingly. I would suggest that the adjustments be made gradually.

Reduce Amount of Coke

If the melting time is too long, it can be accounted for by insufficient volume of air, or faulty iron or coke charges. If the molten iron is extra hot, then it can be assumed that too much coke is the cause. This should be reduced gradually.

After the operator is satisfied that he has the correct ratio of iron to coke, he can build up his iron charges until the maximum is reached. By gradual reduction of coke and increase of iron, providing always that the air is right, a considerable difference will be noted between the time of the first and subsequent melts. Between 60 and 70 lb of limestone to the ton of iron is sufficient as a flux.

By following the foregoing method with the cupola under review, I have been able to increase the melt from 3360 lb in the beginning to 6160 lb per hour at present. The coke bed has been reduced from about 25 in. to 18 or 20 in. above the tuyeres, and never more than 22 in. The iron charges have been increased from 448 to 672 lb. The iron and coke charges, once established, never should be varied from the bed to the end of the heat if an even flow of metal is desired. With the quantity of air previously mentioned, 60 lb of coke should melt 672 lb of iron satisfactorily.

To obtain the best results, the coke bed must be kept at one certain height. If it takes 60 lb of coke to melt 672 lb of iron, then 60 lb should be put back to replace the amount burned, before the next iron charge is put on. Iron and coke charges should be weighed. Some operators charge the cupola by guess. This

may not have the same detrimental effect in larger cupolas, but in those up to 24 in. the effect is very noticeable. At one period the bed is too high, at another, too low, and at the same time the iron charges are either lighter or heavier. The result is that the proper iron and fuel ratio is not kept. Quantity of air either is too much or not enough. With an extra high bed there is no need to be particular about the iron charges, providing hot metal is all that is necessary. If proper costs are kept, the waste of fuel and time will soon reflect themselves in the records.

Light the fire about two hours before charging to allow ample time for the bed to settle down. It is a matter of opinion whether the bed should be put in at once or built up at intervals. I put the whole bed in at once, and have no trouble.

Load the cupola to the charging door about an hour before the blast is put on. By doing this, the first and second charges at least are fairly hot and melt more readily. Some operators put only two or three charges in the cupola before the blast goes on, and the molten metal is flowing well before any more is put in. This is one of the causes of slow melting and dull metal. Too much heat is wasted, and more fuel is needed to give the iron a reasonable chance to melt properly before passing out of the melting zone. I often have seen large pieces of partly melted iron around the tuyeres. This must naturally dull the metal in the well. No argument can be advanced as to why the cupola should not be fully loaded, whereas against the partly loaded cupola, time, fuel costs, and the quality of the metal speak for themselves. Once the level of iron and coke begins to sink, it should be built up again, and kept up. The cupola charger never should come away to attend to the tuyeres or slag hole or anything else until the last charge is well on its way. He possibly may have trouble, and by the time he has rectified it the cupola is partly empty. More coke is necessary to build it up again, otherwise the metal will be much duller, and the flow become irregular.

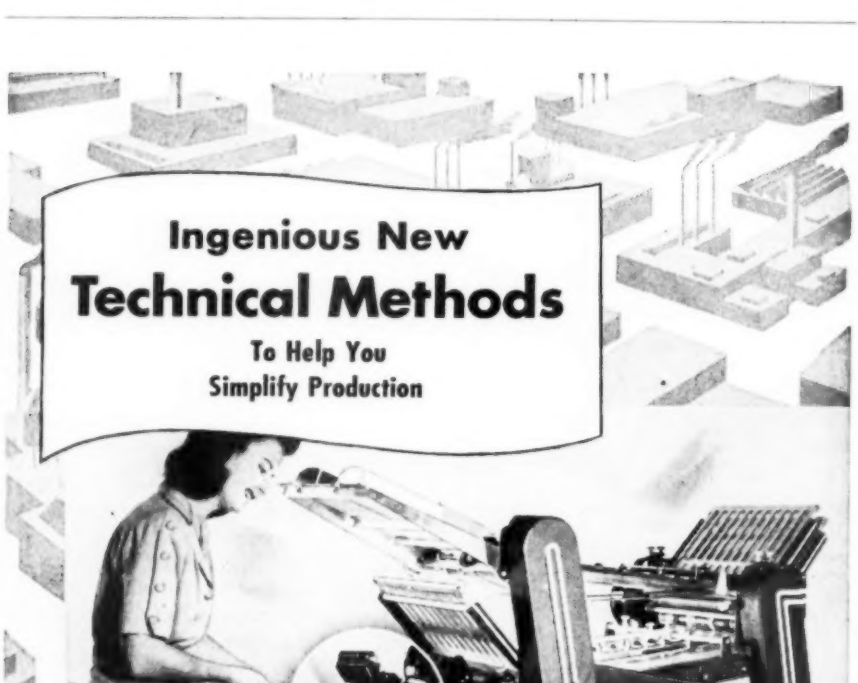
Keep Walls Clean

When repairing the cupola, care must be taken to clean the walls thoroughly before putting anything on them. An old patch in one place and a new one somewhere else will help to hang the iron charges. The coke in the melting zone will burn out before the iron is released into it. Here is another cause of faulty melting.

Too much fire clay never should be used in repairing a cupola. Nearly always it leaves the walls during the melt; if not all of it, then a considerable amount. When it does, it retards the progress of the charges by hanging them up, and when the bottom is dropped, anything left above the tuyeres will stay there. Brick manufacturers make small bricks, sometimes called scones or splits, from 1 to 2 in. thick. Pushed into a layer of clay on the walls they remain there and insure a clean drop. One hundred and fifty tons have been melted in this particular 24-in. cupola before a brick had to be replaced.

The cupola lining should be kept as straight as possible, to prevent the descending charge from catching on an uneven place and hanging there. This also will happen if long pieces form part of the iron charge. They often get caught on the walls. Other long pieces cross them and considerable time and labor is necessary to dislodge them. For good, even melting, the coke and iron charges in the cupola should move steadily. Every-

(*Concluded on page 220*)



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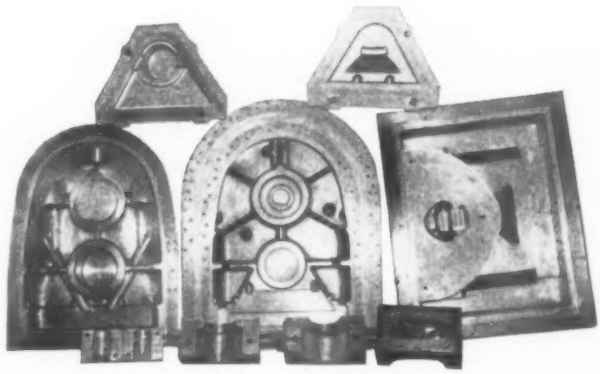

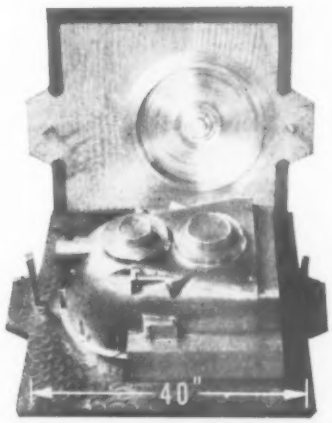

Here are typical examples of all-machined pattern and core box equipment engineered and made by INDUSTRIAL PATTERN. The clutch housing pattern (left), is mounted on cope and drag plates, approximately 40" square. The all-machined core boxes (above) assure high production of *dimensionally-accurate castings* with a minimum of rejects. You're always right with all-machined patterns!

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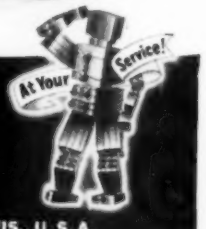

Sterling FOUNDRY EQUIPMENT

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(*Concluded from page* 218)

thing possible should be done to see that nothing obstructs this movement. Hanging up for only a few minutes means lowering of the coke bed.

Large pieces of coke never should be used. Anything above 3 in. is too big. The bigger the coke, the slower the melt, and the duller the metal. Full value is not obtained from large coke, because it passes through the melting zone only partly burned and really is only the equivalent of a smaller coke charge.

Smaller pieces of pig and scrap for the first two or three iron charges is a great help to quick melting. They have not the same chance as subsequent charges of being preheated. Being smaller, they will melt more readily than the larger pieces. Pieces of iron over 56 lb never should be used until near the end of the heat, otherwise pieces partly melted will slow down the heat and will be found later in the well.

The cupola constructed and operated as described is today delivering hot metal into the ladle at less than one penny (Australian) per pound and on heats less than 4 tons. The cupola is one of two in use at the works of the F. W. Hercus Mfg. Co. Ltd., Southwark, South Australia, presently engaged in the production of high class machine tools.

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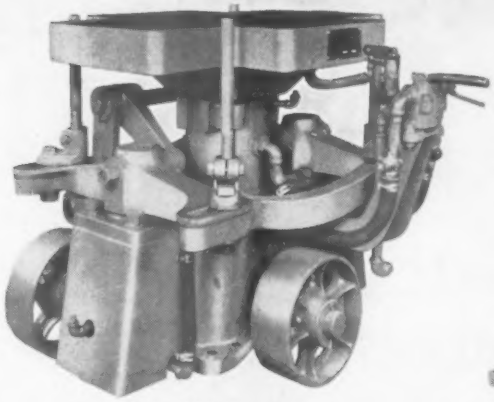
American Management Association 330 West 42nd St., New York 18, has published informative bulletins in the Production Series, available at the prices indicated: "Quality and Expense Control," "Getting and Using Employees' ideas," "The Foreman—The Job and The Man," "Human Relations Opportunities for Management,"—all priced at 50 cents; "Management Techniques for Increasing Labor Productivity," "Production Policies for Increased Output," are obtainable at 75 cents; "Human Aspects of Methods Improvement" at $1. A new booklet in the Financial Management Series, "Over-Hauling Pension and Profit-Sharing Plans," is offered at 50 cents. "An outline of the Supervisor's Job," by John M. Pfiffner, can be secured for 25 cents, or at quantity prices on request. A checklist of significant publications of the association, entitled "Advances in Personnel Management," available without charge, contains a listing of AMA studies in personnel administration selected from seven divisional series.



No. 681-C
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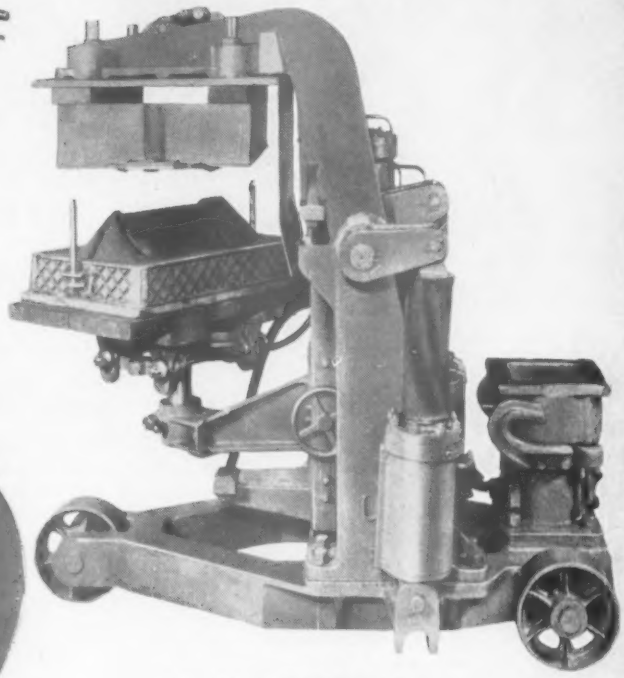

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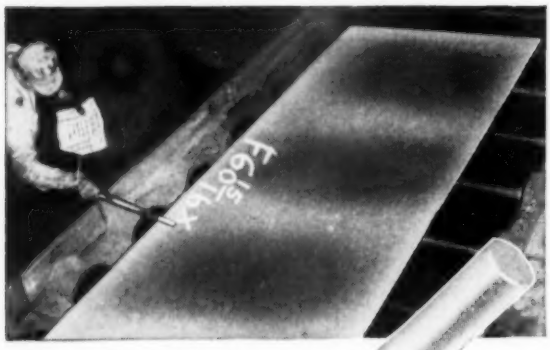

Illustration shows plate being marked at 1800°.

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HOW TO CUT MAINTENANCE COSTS ON AIR EQUIPMENT

(*Continued from page* 93)

provided for in the original estimate.

The final test, of course, of the engineering and planning used in developing and installing the air distribution system is shown by checking the actual load air pressures delivered to the tools or air-driven devices while they are under load. This is easily determined by a checkup throughout the shop with the pressure tester, described in the previous article, which consists of an air gage with a hypodermic needle so that it may be put into the hose while the tool is running. Until all tools show proper pressures under full load, the job of installing and engineering the air distribution system or of maintaining it is not done properly.

Lubrication of Air-Operated Devices—Maintenance costs will also be cut through maximum use of automatic lubrication in the air system. A simple example of this is a down line equipped with a small air lubricator, shown in Fig. 3, which will supply lubricant to, for instance, two small air grinders operating at high speed. These tools are designed as small as possible without room for efficient built-in oil lubrication systems, and running at, say, 21,000 rpm need definite provision for lubrication. Similar lubricators are available for larger grinders, chipping hammers, sand rammers, etc., although these tools will often have built-in lubrication systems. Of course, this type of device must have the reservoir filled periodically.

The life of any pneumatic device depends on its lubrication. One of the advantages of pneumatically-operated devices is that they keep on running under adverse conditions, but production may best be maintained at maximum efficiency by keeping tools well lubricated under severe operating conditions. The exact oil to be used may be discovered by trial and error, but the logical approach is to follow the recommendations of the manufacturer of the product. Straight mineral oil is seldom satisfactory for air-operated devices, and where even a small amount of moisture is prevalent, the use of oils which will properly emulsify in the presence of water is often helpful.

In addition to filling reservoirs regularly, tools should be checked periodically by holding small white

(*Continued on page* 224)

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Bentonite Sales Office: Railway Exchange Building, CHICAGO 4, ILL.

(*Continued from page* 222)

pieces of paper over the exhaust to be sure that lubricant is flowing. When tools are taken out of service to be laid up for a time, a small amount of light oil should be put in the intake and run through the tool for a short time to coat the inside of the tool with oil.

The Modern Repair Shop—The actual maintenance of air equipment should be entrusted to a responsible man who is properly trained, and the entire maintenance program should be put on a periodic preventive basis. When tools reach the repair shop only after they have failed, it is obvious that damage has been done and that the tool has been operating at an inefficient point for some period. Some foundries get tools in and out of the repair shop each day. Others pass out spares once a week to give time to check up on production tools. In any event, a definite time program will pay well in the maintenance department, it will centralize responsibility and will give control of the situation to the management.

The maintenance procedure itself may also be regularized for each type of tool. Manufacturers provide helpful information showing exact details of disassembly and assembly of their own products, as indicated in Fig. 5, but it may be well to establish the principle that governors, which provide the control of maximum free speed of grinders, must always be checked regardless of other repairs, as shown in Fig. 7. A maintenance man should be familiar with the proper speed for each machine and type of wheel, and all grinders should be run a minute and checked with a reliable tachometer every time they reach the tool room.

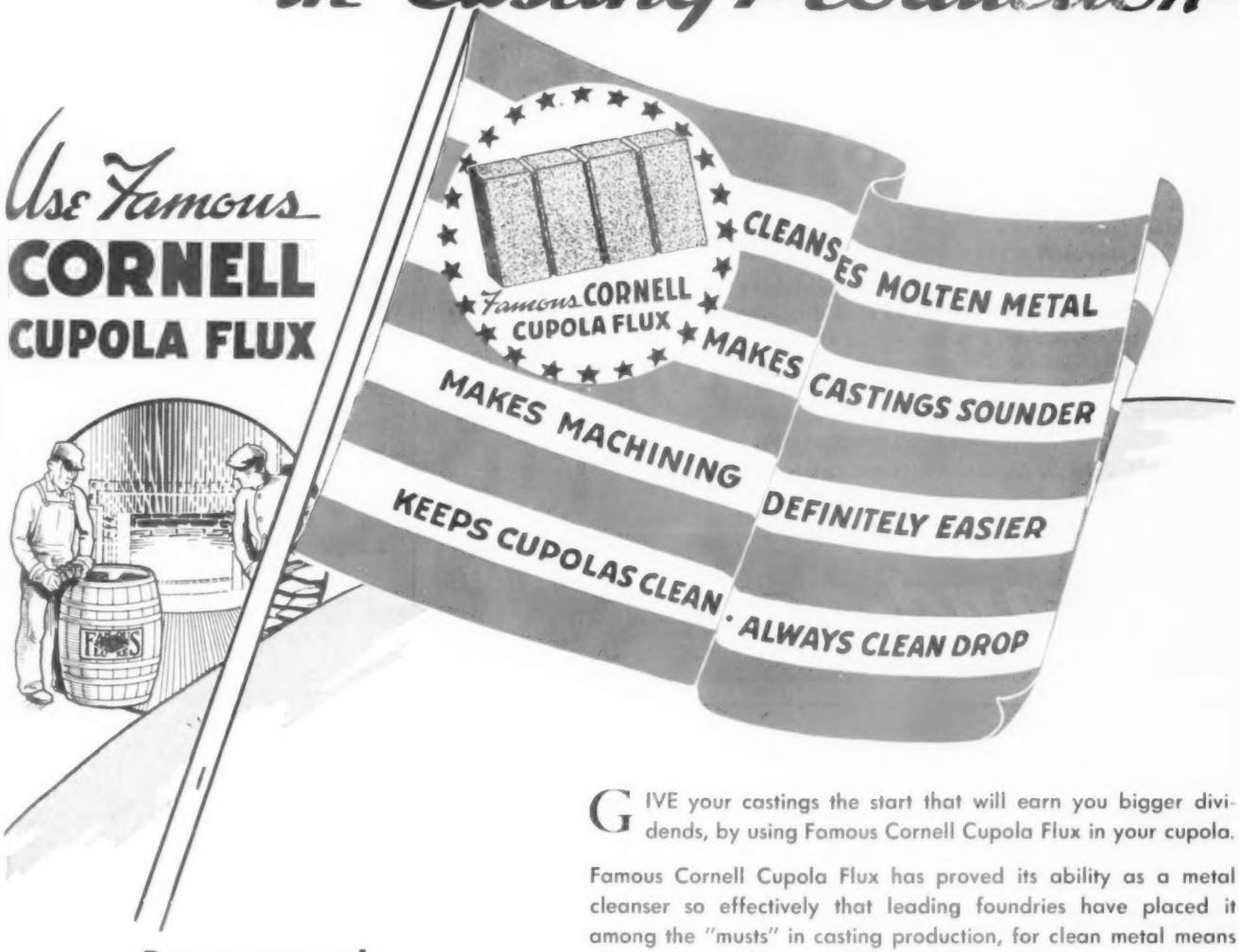
As a matter of fact, the objective of the maintenance room is not merely to keep tools ready, but to repair them to a point of high efficiency. Blades, for example, are the usual wearing point of the rotary motor type of tool, and efficient life of the blade may be greatly increased by adequate and regular lubrication. The blades, if too thin or badly worn, should be replaced promptly, so that the tool delivers full power, as shown in Fig. 6.

The objective of the maintenance room may well be set up to keep the tools running at full efficiency, thus cutting costs. This phase of maintenance work is often overlooked in the supervision of the operation. The use of the pneumatic tool carries with it labor charges of $1 to $1.35 per hour, plus the overhead to pro-

(*Continued on page* 226)

For a "Banner" Year in Casting Production--

Use Famous CORNELL CUPOLA FLUX


Famous CORNELL CUPOLA FLUX
CLEANSES MOLTEN METAL
MAKES CASTINGS SOUNDER
MAKES MACHINING DEFINITELY EASIER
KEEPS CUPOLAS CLEAN · ALWAYS CLEAN DROP

GIVE your castings the start that will earn you bigger dividends, by using Famous Cornell Cupola Flux in your cupola.

Famous Cornell Cupola Flux has proved its ability as a metal cleanser so effectively that leading foundries have placed it among the "musts" in casting production, for clean metal means more uniform, denser grained castings, and easier machining.

Another feature of Famous Cornell Cupola Flux that is greatly appreciated: cupolas are kept clean, drops are clean and labor for maintenance is practically nil.

Write for Bulletin No. 46-B

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SCORED BRICK FORM

Saves Time and Labor. Eliminates Waste.

No digging out of container. No weighing. No measuring. It takes but a few seconds to toss one brick into cupola, for each ton charge of iron or break off a briquette (quarter section) for each 500 pound charge of iron under average conditions. Famous Cornell Cupola Flux does not blow out with the blast, but STAYS in melting zone until entirely consumed, eliminating loss of efficiency.

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Manufacturers of Iron, Brass and Aluminum Fluxes Since 1918

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Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

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Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

"The Outstanding Basic Improvement in FLEXIBLE SHAFT Machinery in 25 Years"

The NEW Strand Rotoflex 4-speed gear drive Flexible Shaft Machine (shown upper right) is another step forward in Strand quality precision tools for faster, easier, more economical production work. The Rotoflex 4-speed gear drive employs a patented, new type of quick change gear drive utilizing 4 positive speeds by a unique and easy method of instantly changing from one speed to another. Rotoflex machines are powered with totally enclosed ball-bearing motors having speeds from 850 to 9000 R.P.M., depending on motor.

Standard type Strand machines, (lower right) give portable rotary power at constant speeds with dependable results in all grinding, buffing, drilling, wire brushing and rotary filing operations. Hundreds of types and models from ⅛ to 3 H.P. available with suitable attachments for your specific requirements.

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Ask for Bulletin No. 43 and Catalog No. 30

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CHICAGO 40, ILL.

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FLEX-RITE Air Valves are the Answer

Positive Valve Action

Just as much or just as little air as required.

Flex-Rite is easy to operate and will appeal to the man on the job. The flexibility of the unit, either straight or angle nozzle, and the easy flexing lever, make it possible for the operator to direct the air stream to the exact spot it is needed without moving into awkward positions.

They save on maintainance costs, as well as time and annoyance. Nothing to get out of order—No packing—No springs—No complicated parts. The rubber valve washer is the only part that might eventually need replacing—an on-the-spot operation costing just a few cents and a few minutes time.

For Further Information Write. . .

FLEX-RITE VALVE & MFG. CO.
118 S. Cheyenne TULSA, OKLA.

(*Continued from page* 224)

vide the necessary facilities, and the maintenance shop which delivers tools back to the operator at, say, 80 per cent efficiency is likely to be an expensive and unsatisfactory unit. It is probable that the difference between repairing the tool at this point and to a satisfactory point is a minor element of time, while the difference in shop production in the ensuing days is a matter of considerable cost.

This matter of efficient repairing is so important that many maintenance shops are equipped with prony brakes, so the tools must pull so many pounds before being put back into service. Once the amount of pull is determined by comparison with new tools, the operation is a simple routine job. It is, of course, possible for an experienced repairman to put the wheel on a scrap piece and tell fairly closely the power delivered, but doing this requires a uniform high air pressure, as shown by gages. Fig. 8 shows a flowmeter for checking air consumption, with line oiler in the line.

Set Up Repair Standards

Obviously, a repairman must be instructed not only to set up reasonable repair standards, but to watch items which tend to prevent future repairs. Ball bearings are a comparatively cheap repair part and should probably be replaced if there is any evidence of wear, as the failure of a ball bearing in service may necessitate major repairs. The repairman should be equipped with all the information from the manufacturer to tell him how to do a good job and how to order the necessary parts. Some help should be given the repairman in setting up the amount of repair parts kept in stock. Certain commonly wearing parts, such as blades, end plates, bearings, etc., should be available.

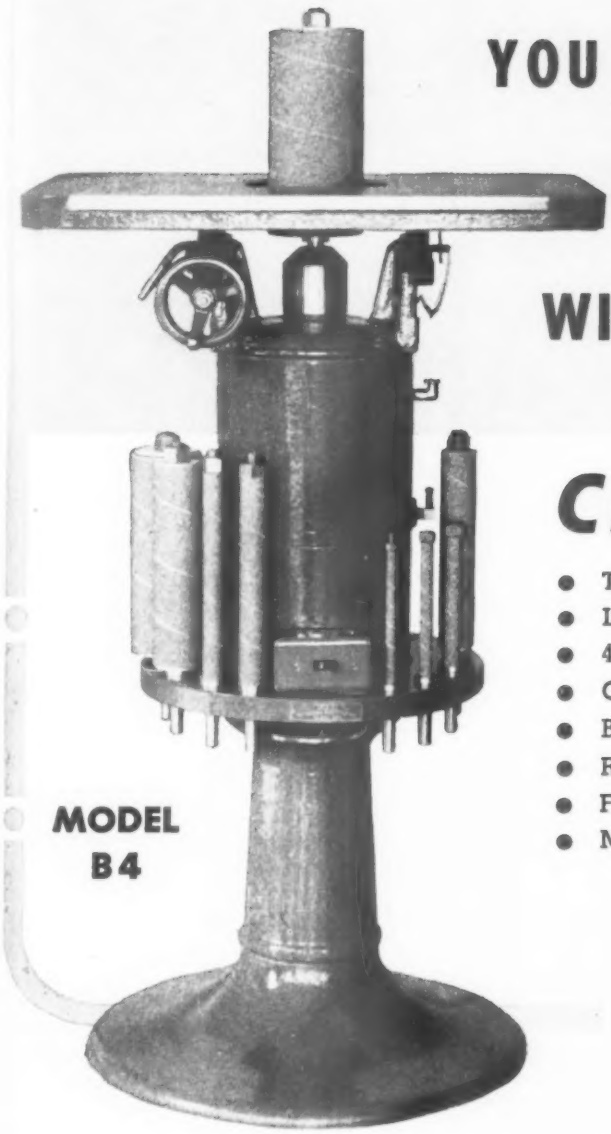
Many shops operate on a maximum-minimum basis for repair parts, keeping reasonable stocks of wearing parts but ordering from the manufacturer in cases of major repair. Since every manufacturer changes models periodically, it is difficult to anticipate just what might be needed in the future, and the policy of many repair shops of stocking large quantities of repairs which may never be used probably is subject to question.

Another opportunity for the repairman is to extend his activity perhaps a bit outside his repair shops by checking conditions of air strainers. Many pneumatic devices are

(*Continued on page* 228)

YOU CAN CHANGE SPINDLES *INSTANTLY*

WITH A STATE OSCILLATING SPINDLE SANDER



MODEL B4

CHECK THESE FEATURES

- Table tilts 45° by worm and gear device.
- Locking device for holding table in position.
- 4″ hand wheel for tilting.
- Oscillating mechanism runs in oil.
- Ball bearing motor enclosed in machine base.
- Rectangular table 20″ x 24″.
- Furnished with 9 spindles (as shown) ready for use.
- Machine weight 285 lbs.

MODEL D15

THERE'S *UTILITY PLUS* IN A STATE 15″ DISC SANDER

- Table 10″ x 22″ tilts 45° each way.
- Locking device for holding table in position.
- Vertical adjustment of table—center to bottom of disc.
- Furnished with mitre gage, dust bag and extra disc.
- Machine weight 300 lbs.

Write Now *for a complete bulletin*

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Pattern Shop and Foundry Supplies and Equipment
Mahogany and Pine Pattern Lumber

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FOUNDRY MANAGEMENT CONSULTANTS

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MILWAUKEE 2, WISCONSIN

January, 1948

THE FOUNDRY INDUSTRY
United States, Canada & Mexico

Gentlemen:

We would like to take this opportunity to put aside the routine and customs of every day business, and in real sincerity, wish you, A PROSPEROUS AND HAPPY NEW YEAR.

Thanking those whom we have had the privilege of serving in the years past, and looking forward to the year ahead, we are,

Cordially yours,
WESTOVER ENGINEERS

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ERIE, PENNSYLVANIA
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(*Continued from page* 226)

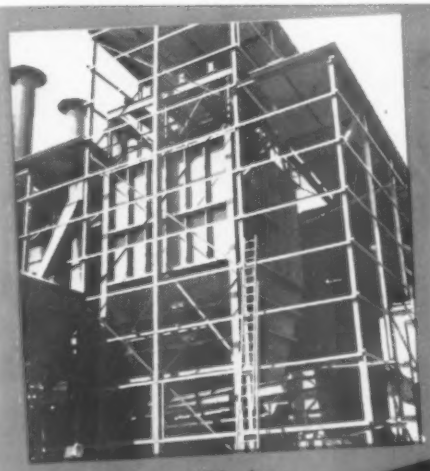
fitted with strainers, as shown in Fig. 10, to keep dirt and scale from entering the device. These often become plugged, lowering air pressures, and many times the operators themselves will impatiently punch a hole in the screen. A certain amount of periodic checking and of telling the story by the repairman will definitely help this situation. Of course, if a clogged screen is found, the strainer is to be disassembled, blown out or a new screen put in. These are short operations, but will increase the life and efficiency of the tool.

Another creative opportunity of the maintenance man is to keep on guard for safety. He is in touch with the actual operations and, if he is properly reinforced by the management, can check the simple safety rules covering operation. Wheel guards, for example, should always be used, and it should be the duty of the maintenance man to replace them if tools are returned without them. The specification on the machine of the exact size wheel should be checked with the wheel being used. Wheel washers should be of the same size, and any irregular washers should be replaced in the toolroom, before reissuing the tool. Spindles should be checked in the repair shop to be sure they are not bent, which will cause vibration and trouble. A repairman, when starting the machine with the wheel mounted, should always start the tool under the bench as an example for the rest of the shop.

Repair the Tool?—Another opportunity of the maintenance man for constructive service is when the question arises, "Does it pay to repair this machine or should it be retired?" Opinions vary widely on this question, but certain facts are necessary for sound deduction. Few foundry executives will authorize repairs of a machine which will cost 80 per cent of that of a new machine. However, when repairs of an old tool, probably abused and in use for a long time, run 50 to 60 per cent of the cost of a new tool, the problem brings up the old analogy of new wine in an old bottle.

It is probable that newer models will provide more power and greater output, but the answer usually gets around to the amount of time the tool is used. If the machine is used constantly, the chances are that the new model will pay for itself compared with the cost of repairing the old one. In fact, the pressure for cost reductions today at foundries is

(*Continued on page* 230)



Shakeout sand bin (capacity 250-tons) and apron conveyor to muller.

Discharge chute and conveyor from sand muller. Note readily adjustable New Way belt take-up.

ALLIS-CHALMERS HANDLES SAND THE *NEW WAY*...

One of the two 24" apron conveyors for delivery to magnetic belt and screen.

In this modern Allis-Chalmers foundry, sand moves in a smooth cycle . . . from molding stations . . . to shake-out . . . to bins . . . to conditioning. All movements are streamlined and automatic, with no lost motion or manual effort.

New Way equipment in the Allis-Chalmers foundry includes: a turntable, conveyors, apron conveyors, sand storage bins, plate feeders, core knockout, elevators, and refuse bin with sand gate.

New Way Sand Handling Systems definitely cut costs. We can point with pride to many progressive foundries that are doing it the **New Way.** Send for literature.

25-ton core knockout and refuse bin, center foreground. Shakeout sand storage bin at right.

Turntable, photographed from pit, showing sturdy roller-bearing rollers and spill sand conveyor.

NEWAYGO ENGINEERING CO.

NEWAYGO, MICHIGAN

THE *New Way* LINE

Sand handling, cooling and conditioning equipment, mold conveying systems, reclaiming units, rapless core drawing machines.

● OFFICES IN ALL PRINCIPAL CITIES ●

ALUMINUM

FOR PATTERNS, PLATES AND MATCHPLATES

USE

Trade **LECTRO-PAT** Mark

The Aluminum Alloy made especially for these exacting castings.

THE CLEVELAND ELECTRO METALS CO.

CLEVELAND, OHIO

HAVING TROUBLE WITH STUBBORN MATERIALS?

Arching-over and plugging-up in bins, hoppers and chutes?

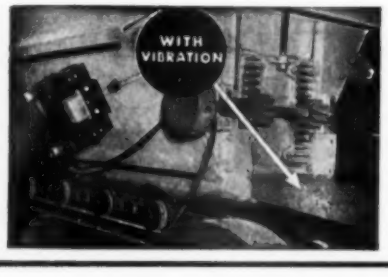
Then Apply the Proper Model

SYNTRON

"Pulsating Magnet"

ELECTRIC VIBRATOR

and watch the material flow!



Eliminate those tattle-tale sledge marks from your bins, hoppers and chutes—stop man-hour and production losses that originate with arching and plugging.

Put these powerful, pulsating electro-magnets to work—just flick the switch and watch the material flow.

Write for illustrated folder.

SYNTRON CO.
540 Lexington, Homer City, Pa.

(*Continued from page* 228)

so great that many executives figure like this:

"A man costs me $44 per week. Overhead cost is some additonal amount which is not clearly defined. If a new tool will produce 20 per cent more, I am making $8 or $9 a week. A new machine costs $150 and repairs $70, so I have to get back $80. This means about nine weeks, with all the intangible advantages of a new machine. Yes, let's get a new machine in this case and either use the old one for light operations or turn it in."

This reasoning is perhaps not entirely correct. The operator uses the grinder only 50 to 80 per cent of the time but, on the other hand, overhead is usually at least as costly as direct labor costs. The repairman has gathered the facts for the foreman and they decide to try a new machine on a trial basis to get the production facts. In actual practice it often arises that, in so doing, he discovers that some other type of tool is really better adapted to the job. This is a matter discussed in a later article.

Repair Chipping Hammers

In the case of chipping hammers, the repairman is called upon to exercise considerable judgment. Operators are particularly critical of the performance of chipping hammers and low air pressure hurts this performance. In repairing chipping hammers, repairmen do not, as a rule, find much trouble with the modern high-speed valves used today. Usually the first point of wear is the chisel bushing. When this wears, says .010-in., air leaks through the front end and the chisel is often not straight when hit a blow, which leads to the trouble. Therefore, it is best to change chisel bushings whenever they show wear.

The point of replacement for chipping hammer plungers is somewhat difficult to find, since with use the plunger in a new chipping hammer tends to wear barrel-shaped. Judgment is necesary to determine the point when a new standard plunger should be inserted, and possibly this process is repeated again before an oversized plunger is used. Meanwhile, it may be well to straighten the cylinder bore. Because of the importance of cost element of chipping operations, particular thought should be given to chipping hammer repairs.

This article has discussed a broad policy viewpoint of the factory and foundry management in relation to

(*Concluded on page* 232)

VERSATILE

DETROIT ELECTRIC FURNACES

MELT DOZENS OF DIFFERENT ALLOYS FAST!

Versatile—that's the word for Detroit Rocking Electric Furnaces, *a wise investment* in flexible foundry operation. They swiftly melt both ferrous and non-ferrous metals in a wide variety of alloys. They melt from 6 lb. to 2 ton heats, depending on model. Many are designed for quick change of shells. It is possible to melt different alloys in a single day. All are equipped with simplified controls that *make production of a broad range of metal analyses easy* because they closely regulate power input, composition, and melting time.

Compact Detroit Electric Furnaces occupy minimum floor space. *They operate cleanly and easily.* And they are economical in power consumption. A Detroit Electric Furnace representative will be glad to discuss your production problems with you and show you how *these modern, versatile furnaces will lower your over-all production costs.*

DETROIT ELECTRIC FURNACES

DETROIT ELECTRIC FURNACE DIVISION • KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

FOREIGN OFFICES: BIRLEC LTD., Birmingham, England, Representative for Europe and British Commonwealth excluding Canada. EQUIPAMENTOS INDUSTRIAS "EISA" LTD., Sao Paulo, Brazil, Representative in Brazil. M. CASTELLVI, INC., 150 Broadway, New York 7, N. Y., Representative in Chile, Argentina, Peru, and Venezuela. CASA COVACEVICH, Mexico City, D F., Mexico

RUEMELIN

Blast Cleaning

CABINETS

Ruemelin Sand Blast Cabinets are designed for use in the smaller gray iron, brass or aluminum foundries. Built in many sizes. Furnished complete with dust control equipment. A Rotary Barrel 16" in diameter can be installed in any of these cabinets to clean very small parts automatically.

Write for Bulletin #32B.

RUEMELIN MANUFACTURING CO.

3850 N. Palmer Street, Milwaukee 12, Wis.

Manufacturers and Engineers, SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS

Are You Using TAMMS
FOUNDRY SPECIALTIES?

Thousands of satisfied users, coast-to-coast, acclaim the TAMMS quality line! Why not send a trial order today?

METALINE

Forms metallic coating over wax fillets or modeling wax buildups. Prevents warm sand from sticking to waxed sections of pattern.

PATTERNSEAL

Seals wood, metal and Super Tamastone Patterns. Eliminates application of parting. Gives cleaner detail — smoother castings. Speeds production.

Liquid PARTING

Keeps sand from sticking to patterns. Does not build-up or interfere with detail. Spray on, dry with air hose. Match plates run a full day with 2 applications.

TAMOLENE WAX

A special liquid wax for coating demountable frames. Makes it easy to remove Tamastone plates from frames. Also recommended as separating liquid for male and female patterns and dies.

PLASTIC METAL

A high quality plastic metal filler that is ideal for filling and smoothing rough metal surfaces of castings or metal match plates. Comes in handy 1/2 pint cans.

MODELING CLAY

An easy working plastic clay that holds detail. Can also be used for changing gates, if shellac or metaline is applied. Designed for foundry or pattern shop.

Made by makers of Tamastone Pattern Compound, No. 90 Iron Oxide, Tamms Demountable Frames, Pyramid Skimmers, etc. . . . order today!

TAMMS SILICA CO., 228 N. La Salle St., Chicago 1, Ill.

(*Concluded from page* 230)

the maintenance department, and has urged the importance of keeping tools not only repaired but repaired to a point of high efficiency. If metal removal tests are made with tools, some poorly repaired and some repaired 100 per cent, the rate of metal removal will be found to increase so greatly that no doubt will exist about the wisdom of thorough, complete and competent repairs.

The first step in cutting portable tool costs is to deliver proper air pressure to the tool itself while operating, as discussed in the previous article. The second step is to set up a maintenance system, keeping tools repaired to the point of 100 per cent efficiency. The concluding article in this series will discuss further ways to cut costs after steps 1 and 2, by selecting the right tools for different jobs in the foundry.

SOURCES OF ILLUSTRATIONS

Figs. 2, 4, 10—Reprinted from *Compressed Air Handbook*, copyright 1947.

Figs. 6, 7—Courtesy Mullins Mfg. Corp.

Annual Apprentice Contest Starts

Competition in the 24th annual national apprentice contest of the American Foundrymen's Association opened the second week in November.

Indentured apprentices in the United States and Canada will match their skills in the four contest divisions: Iron, steel and nonferrous molding, and patternmaking, for industry-wide recognition and for cash prizes and certificates offered by the AFA.

First place winners will be guests of the association at its 52nd annual meeting, the 1948 convention and foundry show in Philadelphia, May 3-7.

Local contests, sponsored by some of AFA's 38 chapters, will select area representatives. Apprentices in other localities may submit entries directly in the national judging, which will be held in Philadelphia next April.

R. W. Schroeder, foundry instructor, Chicago Navy Pier branch, University of Illinois, heads the contest committee, which is a section of AFA's educational division.

Pipe Fittings

Printed copies of Simplified Practice Recommendation R185-47, Pipe Fittings, now are available according to the Commodity Standards Division, National Bureau of Standards. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, for 10 cents each.

Rolling Drawer Core Oven

An improved convection, gas fired, recirculating oven. Operation of drawers is entirely selective. Each drawer furnished with individual operating equipment.

FOUNDRY OVENS from Rolling Drawer to Large Standard and Special Types

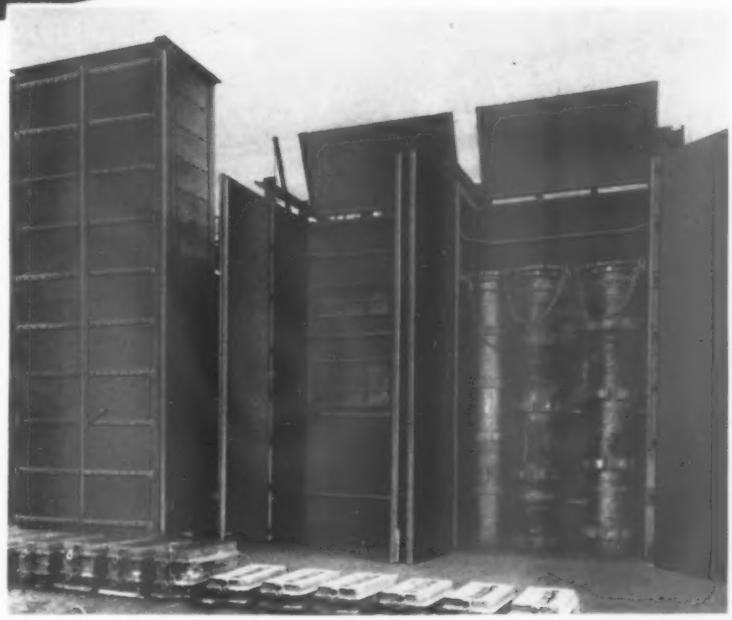
Carl-Mayer CREATIVE ABILITY wins THE ACCLAIM OF OUTSTANDING FOUNDRIES.

Engineers in leading foundries are impressed with the initiative and foresight shown in Carl-Mayer oven design. It is clear that every feature has been created for a definite purpose—better baking, faster baking, fuel economy and long service.

Write for Bulletin

Special Mold Drying Oven

We build special ovens to meet unusual problems. The large oven in illustration is 30′ high, the others, 23′ in height. Furnished with doors on front and top for crane loading. Combination gas-oil recirculating heating system.



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ROLLING DRAWER OVEN

PORTABLE RACK OVEN

VERTICAL OVEN

CAR TYPE OVEN

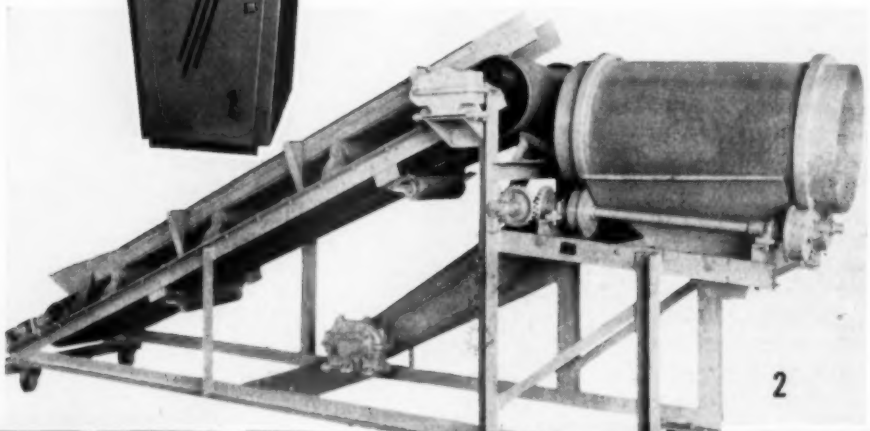
HORIZONTAL MONORAIL CONVEYOR OVEN

The CARL-MAYER Corp.
3030 EUCLID AVE., CLEVELAND, OHIO
CORE AND MOLD OVENS

New Equipment and Supplies

(1)—Band Saw: Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23—New 18-in. band saw is designed for accuracy and high production. Features are: Hard chrome-plated roller guides; heavy duty welded all-steel frame; 3500 fpm cutting speed; lightweight aluminum wheels; safety guards, and heavy duty ball bearings. Machine is 6 ft 2½ in. high overall and 39 in. from floor to table. It will handle work up to 12½ in. under guide.

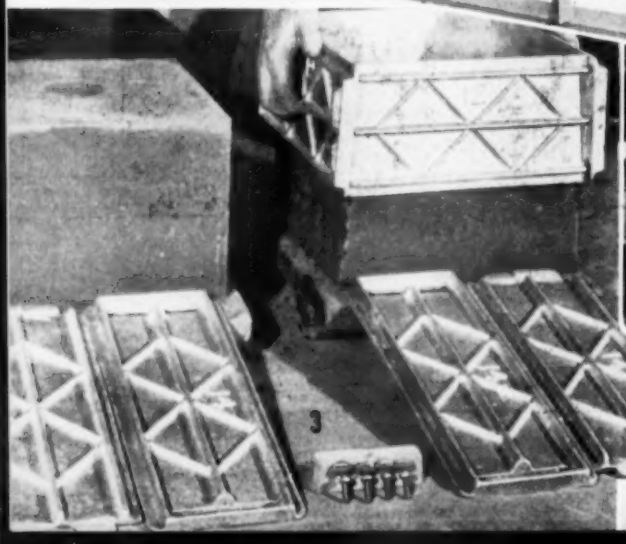
(2)—Magnetic Separator: Magnetic Engineering & Mfg. Co., Van Houten Ave. & Erie Railroad, Clifton, N. J.—Magnetic pulley type separator in combination with a revolving screen was designed for separation of core and molding sand, but has found application in the separation of ferrous and nonferrous materials of aggregate sizes. Material to be separated is fed into the hopper at the low load end and passes on to the inclined conveyor belt, which carries the material over the magnetic head pulley. Magnetic material is attracted to the pulley and is carried around to the underside of the pulley where it is automatically discharged. Nonmagnetic material passes over the brow of the magnetic pulley into the revolving screen where it is sized as required. Overall length of the portable machine, which is supplied with or without motor drive, is 17 ft; load hopper is 30 in from the floor and the discharge end of the screen approximately 5 ft from the floor.



(3)—Jacket: H. W. Hershey, 22 Chelmsford Rd., Rochester 10, N. Y.—Self-aligning aluminum slip jacket is designed to fit both tapered and straight sided molds, and is said to eliminate the necessity of straight and tapered jackets. By removing four set screws, the sides and ends of the jacket are easily interchangeable, making it possible to set up different sizes as needed. The jacket, due to its design, is said to seat itself firmly around the mold with little effort by the molder. Disassembled it requires little storage space.

(4)—Car Unloader: Barber-Greene Co., Aurora, Ill.—Car unloader and stockpiler-loader combine as a team for unloading stone, sand, gravel and other bulk materials from hopper cars. The unloader conveyor consists of a chain and belt riveted together; power is transmitted through chain and belt and is said to give positive belt movement at all times without jam-ups. Drive is by V-belt, through a speed reducer. Capacity is up to 3 tons per minute operating in pits or above rails. The stockpiler-loader has strong stair-channel frame, and swiveling wheels are said to adapt it to all types of unloading and stockpiling service. It is equipped with plain or cleated belts and V-belt drives through two gear reducers and a shaft drive to the head pulley. Three-unit belt carriers mounted on welded steel bases trough the belt and minimize belt wear. Tail pulley cover plate and

(*Continued on page* 236)



Unshackle Workmen!

Free Foundrymen for other Duties . . .

Royer Combination Model "RC"
Capacity 40 to 50 tons per hour.

With a ROYER Combination

Free molders and other Foundry personnel for more productive duties—prepare molding sand in half the time at half the cost. The Royer Combination Scrap Remover and Sand Separator and Blender removes larger scrap first; then performs all six of the necessary functions for correct sand separation at one and the same time: removes smaller trash; blends, mixes old sand with new sand and bond; distributes moisture evenly, increases permeability from 10 to 20 points; and double aerates. The fine, velvety molding sand produced pays off in finer finished castings, increased customer satisfaction and more orders.

Increase production output and make extra profits at the one point where both are easiest to accomplish: the preparation of molding sand. Get more sand output per man-hour, lower cleaning room costs, reduce riddling time, slash discount and discard losses. Many models available. Send for Bulletin 744.

MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

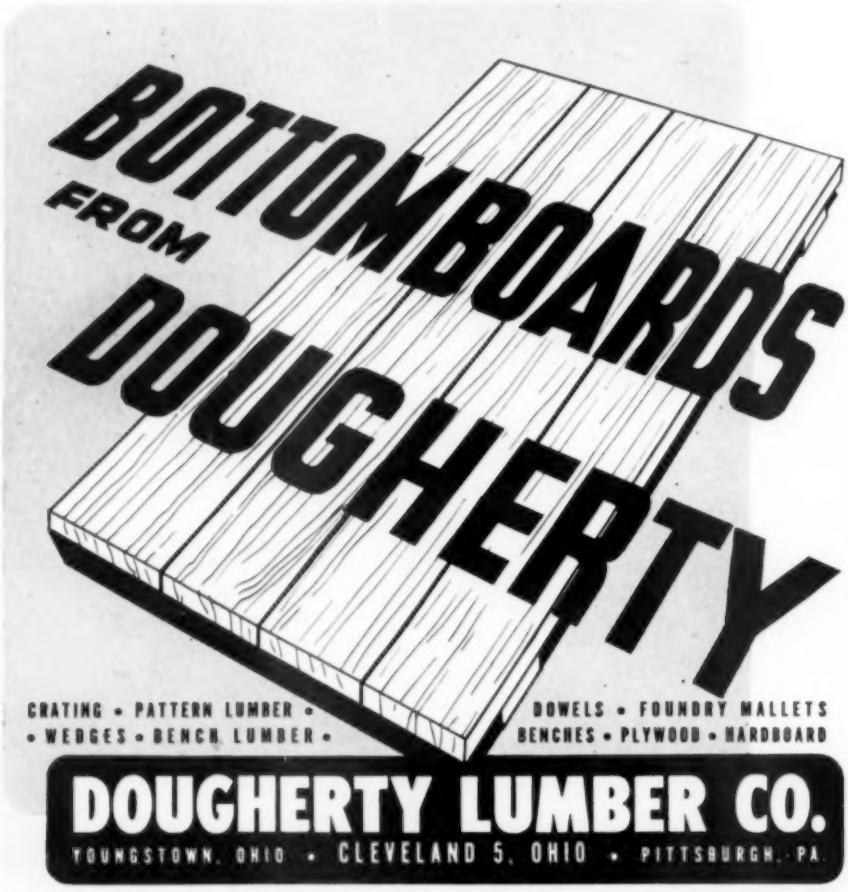
KINGSTON, PENNSYLVANIA

IDENTIFICATION

In all the world, this thumb-print identifies only one individual —the one who made it. Just as this thumb-print identifies an individual, so FINE GRAPHITE, FOUNDRY FACINGS, CORE & MOLD WASHES, PIPE ELIMINATOR, and CARBON RASING GRAPHITE identify ASBURY GRAPHITE MILLS. We are in the second half of our first century of service to the foundry industry, and we still operate on the principle that a good manufacturer is always identified by good products.

ASBURY GRAPHITE MILLS

ASBURY, N. J.



(*Continued from page* 234)

hopper plates are removable. Gasoline or electric motor mounting provides low center of gravity and protection from dust, dirt and weather. Stockpiler is available with belt width of 24 in. and in lengths of 25, 30 and 35 ft.

Dust Collector: Pulverizing Machinery Co., 205 Chatham Rd., Summit, N. J.—New dust collector is said to make successful application of hard-pressed wool felt as a filter. The minute pores of the felt are capable of retaining the finest dust particles, and the company claims to have eliminated clogging of the pores by the use of a hollow, annular blow ring which hugs and

flexes the cylindrical felt bag while moving up and down its outer surface. It is said that minimum recovery of 99.99 per cent of most solids is obtainable in almost all instances, and that dusts containing a high percentage of moisture or oil may be handled. The collector is designed for the following filter rates: minimum, 8 cu ft per sq ft of filter surface per minute; average, 20 cu ft; maximum, over 30 cu ft. In the standard, single bag collectors, the cylindrical felt bag is centered in an air-tight, steel or aluminum housing. Either positive or negative pressure may be used to induce air flow through the bag.

Titrator: Precision Scientific Co., 3737 West Cortland St., Chicago 47—Automatic recording device consisting of two complete titration setups is designed for plotting titration curves. Manual work has been reduced to the preparing of solutions and loading the feed unit. The device is equally suited to aqueous and nonaqueous media and is designed for use with silver, antimony, plati-

(*Continued on page* 238)

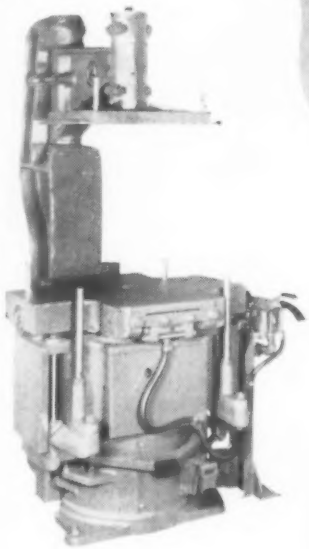
If your requirements are for

Fast, Accurate

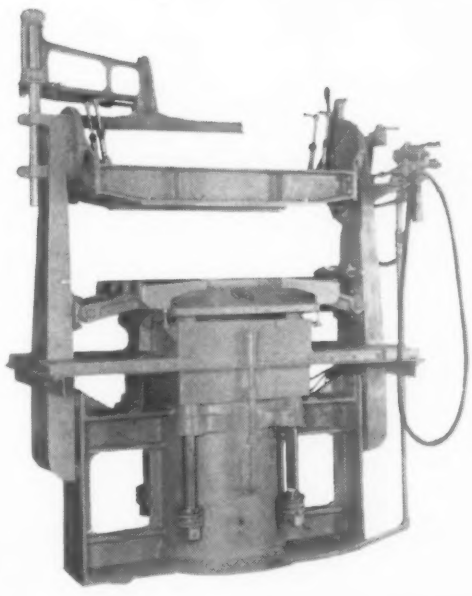
PRODUCTION-

you will certainly consider

SPO MOLDING MACHINES



SPO No. 200 Series Jolt Squeeze Strip Machines, post type (also cantilever). A "fast worker", rugged, profitable.



SPO No. 900 Series Jolt Rollover Squeeze Pattern Draw Machine. A dependable, long-lived performer.

THIS TIME IT'S THE NO. 200 AND THE NO. 900 SERIES . . .

A winning combination—the SPO No. 200 Series for cope molds and the No. 900 Series for drags. Simple design makes possible this quick routine: jolt, squeeze, strip on the 200; jolt, roll over, squeeze, draw, run out on the 900. This is the proven way to slough off waste motion—to jump production and keep accuracy . . . in the No. 200 and No. 900 machines you get the basic advantages of SPO design and construction, especially simplicity, strength and weight where needed, ease of operation, compactness, versatility. Bulletins upon request.

MEMBER

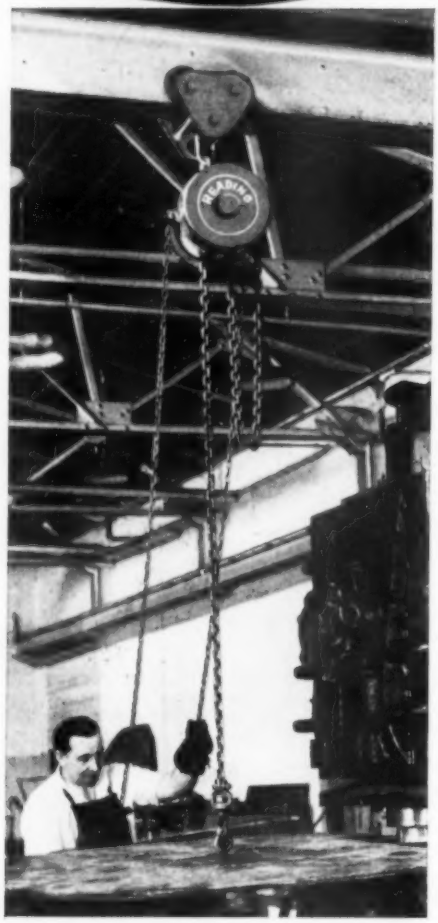
SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE • • CLEVELAND 5, OHIO

TO HOLD LOADS
Accurately
WITH SAFETY



The positive acting friction brake on the Reading Multiple Gear Chain Hoist makes possible accurate positioning of the work or load with complete safety.
The maple inserts in the brake wheel hold the load tightly against the friction disc till the load is to be moved. Lowering requires only that the operating chain be pulled in the down direction. The load lowers without slipping or speeding up.
Each Reading Multiple Gear Chain Hoist is so well built that it has a guaranteed overload capacity of 25% in every size from ¼ ton to 25 tons.
Investigate Reading Hoists for your materials handling problems. Consult your distributor or write us direct.

READING CHAIN & BLOCK CORPORATION
2108 ADAMS ST., READING, PA.

CHAIN HOISTS • ELECTRIC HOISTS
OVERHEAD TRAVELING CRANES

READING HOISTS

(*Continued from page* 236)

num, calomel or glass electrodes. It is claimed that danger of polarizing the electrode system is eliminated because the electrical circuit is designed so that the instrument may measure any potential safely without previous knowledge of the sign. Instrument consists of a reagent-feeding device and a recording potentiometer, and is completely line-operated except for a No. 6 dry cell in the potentiometer circuit.

Hoist-Jack: Coffing Hoist Co., 800 Walters St., Danville, Ill.— Combination hoist and jack is designed to move or lift heavy loads and has capacity of 2000 lb, yet weighs only 23 lb. Complete unit consists of stand, hoist and handle. Hoist has ratchet and pawl construction, a safety handle designed to bend at maximum

overload and a stroke which, at the top, brings the handle to a level just even with the top of the hoist frame. Height of the stand is 42 in.

Glue: Midland Glue Products Co., 1478 Madison St., Detroit— Cold, liquid glue for bonding all types of plywood and wood is said to be easily applied and to set quickly, requiring clamps or pressure for a short time. Features claimed for the glue are that it has high moisture resistance, resistance to heat and cold, is easily sanded off all wood, dries transparent, is free from obnoxious odors, and is stable in storage. The glue is sold in ready-to-use form.

Electrode: Ampco Metal Inc., 1745 South 38th St., Milwaukee 4— Shielded-arc silicon bronze welding electrode was developed for use in fabricating and repairing silicon bronze parts but also may be used to weld copper, dissimilar metals and

(*Continued on page* 240)

LOWER BELT COSTS
Through Our Direct-To-User Sales Policy

All shipments of Imperial Belting are made from our Chicago factory direct to you. This enables you to draw on the largest belting stock in the entire Mid-West. All Imperial men are direct factory representatives . . . you get the personal attention and recommendations of factory-trained sales engineers whose entire interest is on belting.

Sahara Heat-Resisting Beltings For Handling Hot Materials

Foundries have used Sahara Beltings for over 25 years because they are unexcelled for conveying and elevating hot materials.
Standard Sahara is for handling materials up to 300° F., **Insulated Sahara** for use where sustained temperature of materials is from 300° F. to 450° F. Their heat-resisting qualities are due to special impregnation and insulation. Their base is a 37½ ounce, tight-woven duck with a tensile strength exceeding 700 lb. per inch of width. Our double-stitched and Inner-Locked construction permanently prevents ply separation.
May we send you additional information and prices?

Imperial INNER-LOCKED BELTING

Imperial Belting Co.
1755 S. Kilbourn Ave. Chicago 23, Ill.

Engineered Belting—
The Right Belt for Each Job

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your business.*

Maybe "more production" isn't the answer to all our problems

AMERICAN INDUSTRY is already producing at almost double its pre-war rate. Yet with labor and material costs at an all-time high, the experts insist that we must produce still more goods, faster, more efficiently, if we are to avoid another boom-and-bust cycle.

We'll buy that—as far as it goes.

But let's never lose sight of the fact that production is only half the problem. Because for every increase in our rate of production, there must be a comparable rise in our *rate of sales.*

Actually, of course, there is no such thing as producing goods at a profit. Goods are *sold* at a profit—yes. And while production line savings are vitally important, it is of equal importance to keep down the cost of *manufacturing sales.*

That is the function of *mechanized selling*—to produce sales on a mass production basis, and at the lowest possible cost per unit. Translated into more familiar terms, it simply means advertising to the right market, in the right way, at the right time.

Like the machine on the production line, good advertising is a multiplier of men's efforts, for it enables us to produce (and *earn*) far more than we could alone. And when it goes to work in business papers — with their tremendous concentration of hand-picked readers —advertising becomes the most efficient machine at our disposal for *manufacturing sales at a profit.*

What are the ten ways to measure the results of your business paper advertising? You'll find the answers in a recent ABP folder, which we'll be glad to send you on request. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.

THE FOUNDRY—

is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.

HOW CAN A SAFETY PROGRAM SUCCEED...

WHEN QUALITY EQUIPMENT IS LACKING?

● Safety equipment must be well made, durable, properly designed for wearing comfort, and dependable at all times. Products that are "just good enough" can be real hazards. Likewise, worn-out equipment offers border-line protection.

AN EFFECTIVE SAFETY PROGRAM DEMANDS THIS...

Use quality safety equipment. Use CESCO, because CESCO equipment exceeds safety standards. Every CESCO product is made of highest quality material, and embodies expert workmanship. CESCO quality is backed by 44 years experience in manufacturing safety equipment.

So, standardize on CESCO and watch your accident rate go down.

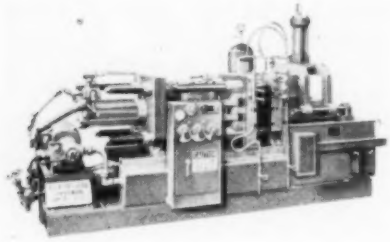
CHICAGO EYE SHIELD COMPANY
2336 Warren Boulevard
Chicago 12, Illinois

CESCO
FOR SAFETY

(*Continued from page* 238)

ferrous base metals. It operates on reverse polarity direct current. Coating and core wire is designed to produce a spray type arc action, low spatter loss, free-flowing slag and weld metal. Slag is said to be friable and easily removed. Electrode is available in 3/32, ⅛, 5/32, 3/16 and ¼ in. diam.

Die Casting: Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12—Die casting machine is designed for fast, economical die casting and is said to be capable



of locking dies with great pressure to produce castings with a minimum of flash, with strength to resist stretch, distortion or breakage. Features claimed for the machine are automatic timing, selective manual controls, generous die area, large die plates, wide spacing between tie-bar centers for quick insertion of large dies, efficient shot control mechanism and hydraulic controls for ejection and core pulling.

Fork Truck: Baker Industrial Truck Division, Baker-Raulang Co., 2168 West 25th St., Cleveland 13—Small, light-weight fork truck of

1000-lb capacity finds application where narrow aisles, congested areas, limited floor capacity, small and low capacity elevators are a factor. Truck has 36-in. wheelbase; overall length, exclusive of forks, of 53⅝ in., and is 28 in. wide. To make a right angle turn the truck requires 67½ in. plus the length of the load, and since the truck is designed for a 1000-lb load 30 in. long, a right angle turn can be made in 97½ in. Forks raise 9 ft from floor, and fork carriage tilts backward 10 degrees and forward 3 degrees. Truck has three speeds forward and reverse.

Water Hose: Hewitt Rubber Division, Hewitt-Robins Inc., 204 Kensington Ave., Buffalo 5—Water hose known as Maltese Cross brand has heavy brown cover and is supplied in lengths up to 500 ft. Constructed to withstand high pressures, it is designed for use where long-lasting construction is essential. Production of this grade was suspended during the war.

Ventilator: Warner Ventilator Co., La Grange, Ind.—Spinner type ventilator is equipped with step type ball bearings and is propelled by the slightest breeze. The spinning blades are said to create a vacuum, thereby drawing hot air, gases, fumes or other

contamination out of buildings on which the ventilator is mounted. Blades are shaped and spaced so as to emit contaminated air without permitting the entrance of rain or snow. Spinner unit is mounted on a square base which can be cut to fit roofs of any pitch. Units with circular base for mounting on stacks are also available.

Milling Machine: Van Norman Co., 3640 Main St., Springfield, Mass.—Ram type milling machine features an adjustable cutter head and movable ram which permits horizontal, vertical and angular milling with standard milling cutters and conventional milling practices. Power feed is provided for table longitudinal travel. Table feeds and spindle speeds are controlled by quick-change levers which provide for nine feeds ranging from 0.6 in. per minute to

(*Continued on page* 242)

Quantity
PRODUCTION
of
GREY IRON CASTINGS

*

ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

*

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

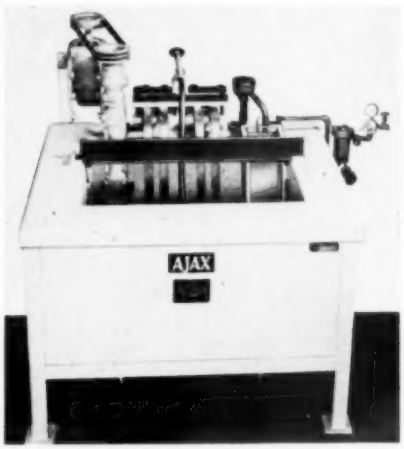
MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

(*Continued from page* 240)

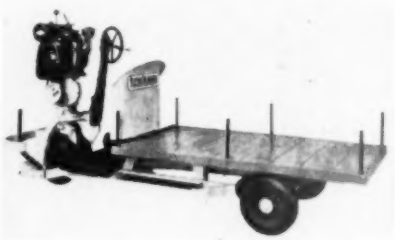
16 in. per minute. Nine spindle speeds from 95 rpm to 2000 rpm are selected by two levers. Handwheels are provided to give cross feed, vertical feed and table adjustments. Large dials are graduated in thousandths.

Quenching Furnace: Ajax Electric Co. Inc., Frankford Ave. at Delaware Ave., Philadelphia 23 — Electrode salt bath furnace for interrupted quenching operations employs the principles of a heat exchanger to hold the quenching bath at a constant temperature. To provide maximum cooling, the bath is agitated vigorously to extract rapidly the heat from the work being quenched. This bath is said to give the quenching power of warm oil, assuring uniform and maximum quenching speed of each piece introduced into the furnace. In martempering and austempering, the work is usually austenitized by heating in a neutral salt bath prior to quenching in the isothermal quench bath. Use of a salt separator is said to eliminate the problem of contamination of the low temperature quenching bath by salt carried over with the work from the high temperature austenitizing bath.



Dust Control: Johnson - March Corp., 52 Vanderbilt Ave., New York —Wetting agent compound is claimed suitable for the control of silicaceous sand dust. Combined with water to reduce the surface tension of the water, thus permitting it to wet the dust, the solution is sprayed over sand and dirt on floors and aisleways to keep the dust from being stirred up. It also may be sprayed into the air through misting nozzles, causing dust particles to fall to the ground, it is claimed. The compound is made as a solid in cartridge form and is dissolved automatically when water runs over it through a simple flow proportioning unit.

Platform Truck: Truck - Man Inc., 1406 West Ganson St., Dept. G1, Jackson, Mich.— Platform utility truck has platform 3 x 5½ ft and 1500-lb capacity. Powered by a 2¼-



hp gasoline engine, it has full high and low speed forward or reverse and will turn in its own length. Length overall is 108 in.; wheelbase, 72 in.; ground clearance, 5½ in.; loading height, 16 in.; tires, four 6-ply pneumatic industrial tires, size 4½ x 14 in.

Vacuum Cleaner: Spencer Turbine Co., Drawer E. Station A, Hartford 6, Conn.—Industrial portable vacuum cleaner has 1½ cu ft dirt container which is rolled away on casters for emptying, a pan for holding vacuum tools at the bottom of the machine, and a metal rail around the top of the machine which enables the operator to move the machine in any direction. The standard machine is operated by a universal motor, but may be obtained with belt drive for cases where direct current or multiphase operation is desired.

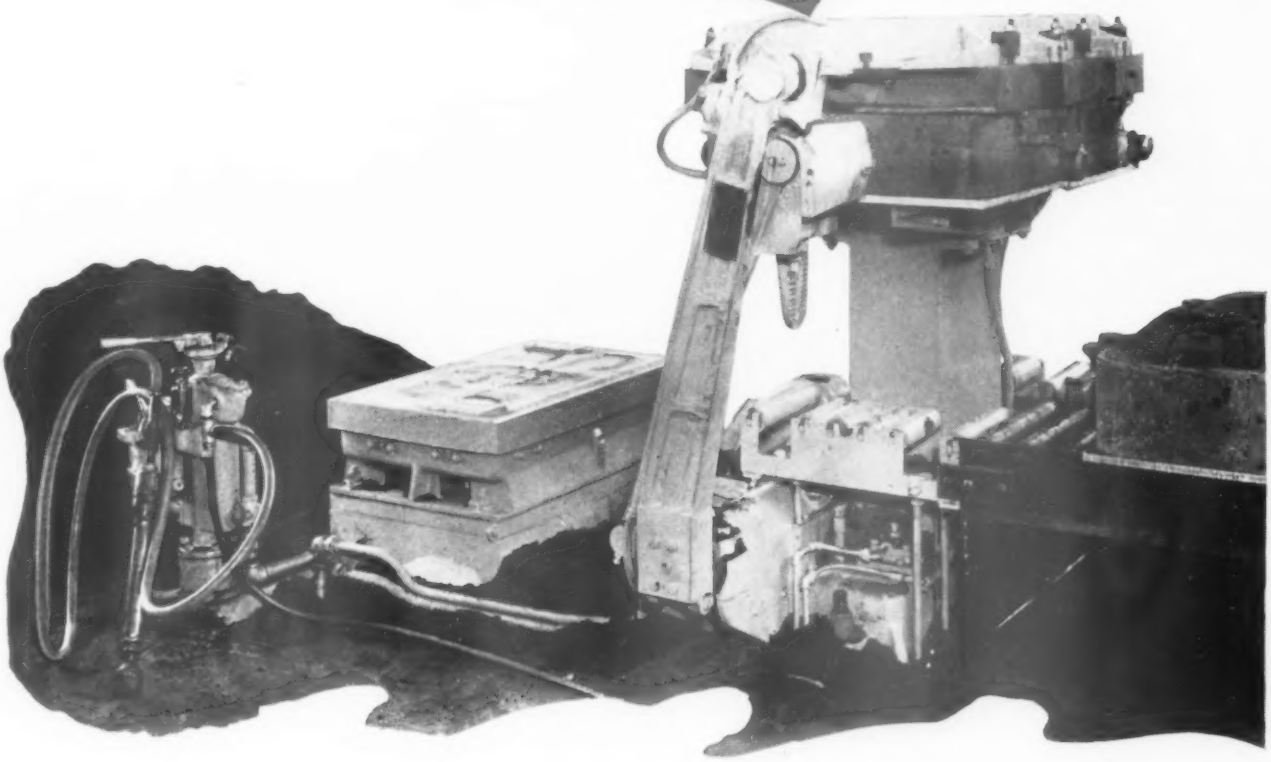
A wet separator is available for collection of wet materials and liquids. Machine comes in a 1½ hp model recommended for intermittent service and a 2 hp belt-driven model for continuous service or where 3-phase operation is preferred.

Hand Pump: Bowser Inc., 1302 East Creighton Ave., Fort Wayne, Ind.—Meter-equipped, rotary hand pump is built for fueling or dis-

(*Concluded on page* 244)

Smooth Flowing POWER

FOR HIGH SPEED PRODUCTION



You will be amazed at the smooth, tremendous, dependable, hydraulic power of Herman Molding Machines. And you will be thrilled with the economy of operation and with the outstanding speed of production.

You need lots of well-directed power to make perfect molds fast and cheaply. Herman engineers, with their research directed solely on molding problems and molding machine design, have made a specialty of applying power correctly, smoothly and economically to molding machines. Only Herman Molding Machines give the patented roll-over action that provides a complete 180° roll-over with power applied on only 90° of the roll!

Ask a Herman engineer to call on you to explain the advantages Herman Molding Machines offer in increasing production of perfect molds at lower unit cost—and molds that produce perfect castings. There will be no obligation on your part.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

"RAPID" MOLDING MACHINES

★

PORTABLE JOLT SQUEEZER R9X

WRITE for NEW BULLETIN "F"

PORTABLE HAND SQUEEZER R-10

PIONEER MANUFACTURING CO.

Molding Machine Manufacturer for Over 20 years

MILWAUKEE (West Allis) WISC.

(Concluded from page 242)

pensing of liquids up to 10,000 S. S. U. viscosity. Meter registers to 8 gal and is equipped with a 9999-gal totalizer. Complete unit includes a 40-in. suction pipe with bung attachment, 8-ft oil-resistant discharge hose and aluminum nozzle. Features of the pump include a 10-gpm capacity, aluminum rotor, graphite-carbon vanes, cadmium plated packing nut and stainless steel springs.

Truck Loader: Day Co., 306 West 69th St., Chicago—Hydraulic tail gate loader for trucks operates over the full distance from ground

to truck floor level, raising and lowering loads to 1200 lb. Platform remains level throughout its entire travel arc, and swings up to serve as a tail gate when the truck is on the road. Hydraulic pump is driven from the truck's standard power take-off and is controlled by a convenient lever, or the pump can be manually operated. Loader fits most standard 1½-ton trucks.

Fans: Joy Mfg. Co., Oliver Bldg., Pittsburgh 22—Company's line of adjustable-blade fans for heating, ventilating, and air conditioning installations consists of axial-flow fans of the vaneaxial type designed for a range of pressures up to 9.60 water gage and volumes up to 100,000 cfm. The fans are available in 124 models from combinations of 15 different housing diam (18 to 60 in.) 4 hub sizes, 16 motor frame sizes and 4 different speeds.

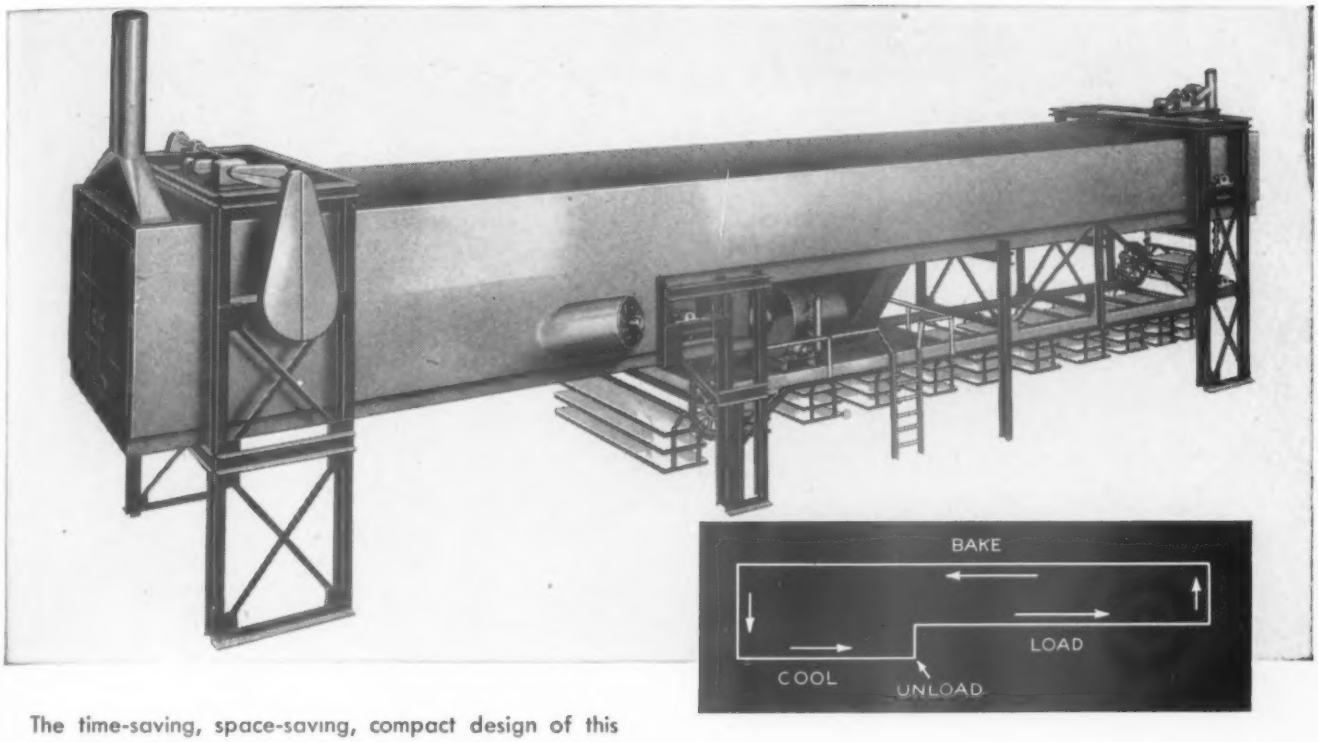
Regulator: North American Mfg. Co., 4455 East 71st St., Cleveland 5—Soft seat atmospheric regulator for users of low pressure gas in the industrial heating field features tight shut-off when the demand for gas flow ceases by incorporating a soft synthetic rubberized fabric facing on the regulator valve head. Regulator furnishes gas at atmospheric pressure and requires as a supply, gas pressure of 2 to 16 oz. Although it was designed especially for supplying atmospheric gas to premix systems, single valve control also can be had with nozzle-mix systems by connecting the vent on the regulator into the line supplying air to the burner on the downstream side of the control valve, it is claimed. Made in sizes ¾, 1, 1¼, 1½ 2, 2½ and 3 in., the regulator has a capacity ranging up to 16,000 cfh of natural gas or 19,000 cfh of manufactured gas.

Photographic Paper: Eastman Kodak Co., Rochester 4, N. Y.—New silver-sensitized paper for reproducing engineering drawings on blueprint or direct-process equipment embodies a new type emulsion which permits its use in normal room light and produces a high-contrast positive copy directly from a positive original. Detail is fine and either the "print-through" or the "reflex" method of printing may be used. After printing, the paper is processed according to conventional photographic practice, but in normal room light.

Conveyor: George Haiss Mfg. Co., division of Pettibone Mulliken Corp., 381 Canal Pl., New York 51—Portable trough conveyor is designed for handling all loose materials from hopper bottom cars to trucks or storage piles or from storage piles to trucks, bins, etc. Conveyor is built in standard belt widths of 16, 20 and 24 in. and standard lengths from 20 to 60 ft in multiples of 5 ft. It may

be fitted with an electric motor or gasoline engine and mounted on steel or rubber tired wheels. Capacity is 60 to 180 tons per hour.

Oil Standby: Surface Combustion Corp., 2375 Dorr St., P. O. Box 907, Toledo 1, O.—Oil standby equipment is designed for use with most of the company's gas burner equipment. It uses No. 3 or lighter furnace oil and provides the same Btu input-hr as is provided with the gas burner equipment. Once installed, the oil standby equipment can be put into use quickly when needed.



The time-saving, space-saving, compact design of this new Horizontal Core Oven is characteristic of Young Brothers' Engineering. Into it went the skill and confidence of many years of experience . . . also a thorough knowledge of the job to be done and the production problems involved.

This new core oven can be installed in practically any building without making any major structural changes.

The coremakers are located right next to the oven so that they can load the cores directly on the moving racks thus eliminating the necessity of transporting them on hand trucks or a conveyor from the core room. The location of the coremakers, at the oven, also saves core room space.

The size of the loading racks can be varied and the shelves can be adjusted to accommodate cores of many sizes and shapes.

Besides allowing for the removal of exhaust gases at the point of greatest concentration, the new oven design provides an effective cooling zone for the cores and assures comfortable working conditions for the coremakers.

This New Horizontal Core Oven is Young Brothers' answer to the demand for better core baking equipment. It is YOUR answer to the need for lower production costs and higher operating efficiency.

New HORIZONTAL CORE OVEN . . . . . offers many cost saving advantages!

MEMBER

YOUNG BROTHERS COMPANY

6508 MACK AVENUE **DETROIT 7, MICHIGAN**

ESTABLISHED IN 1896

...TRADE PUBLICATIONS...

SHOT PEENING: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind.—Revised edition of "Shot Peening" is divided into two sections—one presents a study of the practical application of shot peening with methods of handling the work and controlling the quality of the operation emphasized; the other discusses in detail the theory of fatigue and how it is affected by shot peening. Comprehensive papers on the subject by men in the field are included.

HOLE SAWS: Misener Mfg. Co., 202 Walton St., Syracuse, N. Y.—Brochure describes the company's complete line of single-cut rotary hole saws and explains the multiple-cut rotary hole saw which consists of one tool head grooved to accommodate different sized blades. Photographs show the saws used in connection with portable electric drills, on lathes and drill presses and other power tools.

MAGNETIC SEPARATORS: Eriez Mfg. Co., 3004 East Twelfth St., Erie, Pa.—Bulletin 102-B describes and explains the company's magnetic equipment designed for industrial processing lines. Specific applications and the magnetic equipment necessary to do the job are discussed. Pertinent data and engineering drawings showing size, weight and construction of units are included.

VALVES: Foxboro Co., Foxboro, Mass.—Bulletin 277-2 deals with pneumatic control valves and controller accessories. A color page shows identifying enamel valve finishes corresponding to the color code of the American Standards Association. Specifications, information on computing valve sizes and other pertinent data are included.

METALS DIRECTORY: Federated Metals Division, American Smelting & Refining Co., 120 Broadway, New York 5, Dept. SJ—Pamphlet lists over fifty basic nonferrous alloys in all available forms—ingot, pig, bar, wire, ribbon, sheet, shot, slab, etc. Foundry metals, solders, type metals, babbitts, and die casting metals are included.

BUNG WRENCH: Ampco Metal Inc., 1745 South 38 St., Milwaukee 4—Bulletin describes bung wrench designed to open 15 different closures or bungs in kegs, barrels and other containers. Bulletin contains a picture of the wrench, a diagram showing the dimensions of the bungs and views of the wrench in action.

LIFT TRUCK ATTACHMENTS: Clark Tructractor Division, Clark Equipment Co., 258 West Champion St., Battle Creek, Mich.—Company's current issue of "Material Handling News" shows a number of interchangeable attachments for fork-lift trucks. These attachments adapt the trucks to special handling assignments, thus increasing their versatility.

V-BELT DRIVES: Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee 1—Book presents engineering information on stock and made to order drives and pre-engineered stock V-belt drives. General information, illustrations and engineering tables describe the company's V-belts and sheaves—their characteristics and uses.

ACETYLENE GENERATORS: Sight Feed Generator Co., Richmond, Ind.—Catalog TF contains illustrations, descriptions and costs of acetylene generators for stationary installations. Similar information also is given on auxiliary equipment for pipeline installations.

SYNTHETIC RESINS: Hercules Powder Co., 900 Market St., Wilmington 99, Del.—Technical booklet describes the properties and uses of all the company's synthetic resins. Booklet contains a chart which matches the various resins with their actual and potential uses.

AFTERCOOLERS: Ingersoll-Rand Co., 11 Broadway, New York 4—Form 3014-B describes the benefits, principle and application of aftercooling and contains a complete description of a line of aftercoolers for air power lines and gas distribution systems.

MATERIALS HANDLING: Lewis-Shepard Products Inc., 290 Walnut St., Watertown 72, Mass.—Catalog 23 of 86 pages contains illustrations of each type of the company's equipment with installation photographs reproduced in duotone.

CONVEYORS: Robins Conveyors Division, Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.—Bulletin 120-A1 presents information necessary for laying out a belt conveyor system. Features of the company's idlers are described.

FLEXIBLE COUPLING: Dodge Mfg. Corp., 1938 William St., Mishawaka, Ind.—Bulletin A-410 describes company's flexible coupling and shows assembled and exploded views of it. Specifications, prices and horsepower ratings are included.

STEEL FURNITURE: Precision Equipment Co., 2656 North Long Ave., Chicago 39—Circular illustrates and describes steel shelving, drawers, cabinets, chairs, waste receptacles, trucks, stands, pans and other steel equipment. Prices are included.

MOISTURE TESTER: Harry W. Dietert C., 9330 Roselawn Ave., Detroit 4—Illustrated folder describes the company's portable electric moisture determinator for the determination of moisture in foundry sand.

PORBECK DRAWER TYPE OVENS

GAS OR OIL FIRED
WITH RECIRCULATING
AIR HEATERS

UNIFORM CORES CONTINUOUSLY
WITH LOW COST OPERATION

Strictly a *production* unit—note that all drawers operate independently of each other. Comes completely equipped with latest type temperature indicating controls (variable 100° to 650° F) and high efficiency recirculating air heater. Sturdy construction with 4-1/2" fibre-glass insulation throughout. Users commend Porbeck ovens for their space and time saving features. Available in several types and sizes. We invite your inquiry.

WRITE FOR NEW CORE OVEN BULLETIN "F"

PORBECK MANUFACTURING CO.

Manufacturers since 1894 of Core Ovens, Mold Dryers, Processing Ovens, Mold Drying Ovens, Heat Treating Ovens, and Paint Baking Ovens.

2600 N. Ninth St. **St. Louis 6, Missouri**

SENSATIONAL • NEW • LIGHTWEIGHT

Edco Dowmetal

BOTTOM BOARDS

--so DURABLE they can be considered *Permanent Equipment*

The revolutionary new EDCO DOWMETAL Bottom Boards have so many advantages over anything previously known that they are finding immediate acceptance in foundries throughout the country.

These boards are made of *magnesium*. They are even lighter in weight than wood, and possess incredible resistance to heat. They will not warp or break, and normal "run-outs" and "spills" of molten metal will not harm them. There are no nails to come loose, nothing to break or split.

EDCO DOWMETAL Bottom Boards may be considered permanent foundry equipment because of their durability under most foundry conditions.

You will find that EDCO DOWMETAL Bottom Boards will save you money because they give better mechanical results and last so much longer than even better-than-average wood boards.

Write for complete details and prices covering the wide range of standard sizes.

When used as a combination squeezer and bottom board, EDCO DOWMETAL magnesium boards give firm, equal distribution of pressure, eliminating mold "shifts", "breaks" or "cracks". They maintain high quality of castings and reduce rejects because special *vented design* permits escape of gasses and helps retain sand permeability.

CHRISTIANSEN CORPORATION

Executive Offices: One North LaSalle St., Chicago 2, Illinois

EASTERN DIVISION
50 Rockefeller Plaza, New York 20, N. Y.

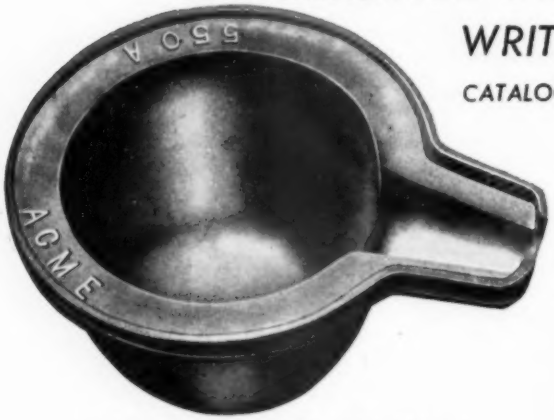
★ ★ ★

WESTERN DIVISION
831 S. Flower St., Los Angeles 14, Calif.

Other EDCO Products: Aluminum — Magnesium — Zinc — Brass and Bronze Alloy Ingot

MELTING POTS—Ingot Molds

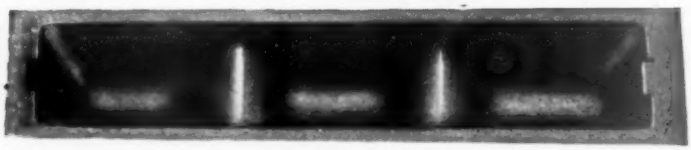
for ALUMINUM AND OTHER NONFERROUS METALS. 45 SIZES.



ROUND SPOUT POT NO. 550A
WITH 1½" COLLAR ON FLANGE

WRITE for
CATALOG "F"

HOLDING——→
BOWL NO. HP7001



INGOT MOLD NO. AA-6

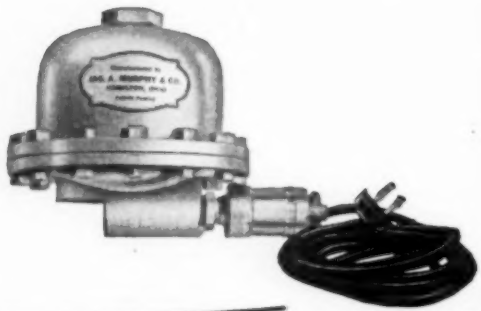
Made of Acme SPECIAL-M-Heat Resisting Iron — They Stand the Heat!

ACME FOUNDRY COMPANY

DETROIT 16, MICHIGAN

2502 TWENTY-SECOND ST. PHONE TASHMOO 5-2404

Thermotrap

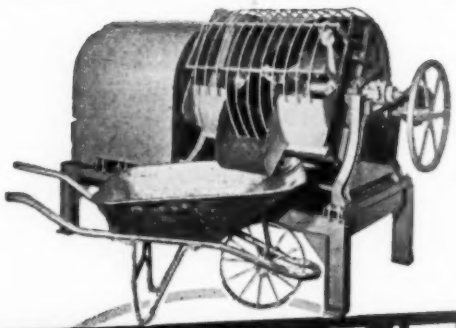


FOR POSITIVE PROTECTION AGAINST FROZEN AIR LINES, TANKS AND TOOLS, install Murphy Thermotraps at points in your compressed air system which are subject to freezing temperatures. They automatically eject all condensate, require no attention, no special fittings; receive no wear. Current consumption only 50 watts. Guaranteed. Write for literature.

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch



BLYSTONE • MIXERS •

THE paddle-type mixer for core sand mixing in the foundry. Blystone Mixers offer: low mix cost, thorough mixing, and easy operation. There is a sturdily built type and size for your problem. Send for Bulletin and full details.

• BLYSTONE DIVISION •
STANDARD SAND & MACHINE CO.
549 W. Washington Boulevard, Chicago, Illinois

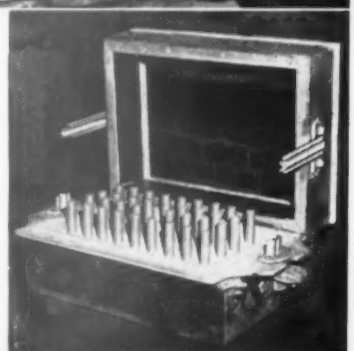
OUR BELT MACHINES are built in lengths 12 to 24 ft. with or without cleats —TROUGH or FLAT. Very efficient for handling slack, pea and nut coal, coke, sand, gravel and other loose material.—We use the best rubber belts obtainable.

WELL AND STRONGLY BUILT—YOUR ORDERS WILL HAVE PROMPT ATTENTION

THE GODFREY CONVEYOR CO., INC.
ELKHART **INDIANA**

Make EVERY Lift a PERFECT Lift

with BUCKEYE "3-in-1" *(Patented)* FLASK GUIDES



Because of the *patented* three V-shaped tongues on the pin, the cope won't rock or shift while being lifted from the drag—you get a true perpendicular lift every time.

Pin, slide and match plate lugs are interchangeable, no need to realign if replacement is required.

To retain absolute pattern contour, cut costs and increase production, specify Buckeye "Three-In-One" Patented Flask Guides for all straight or tapered flasks. Furnished in 3, 4, 5, 6, 7 and 8" lengths. Write for full details and prices today!

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Manufacturers of Core Oil • Parting • Core Compounds • Refractory Cements • Flask Fittings

HAVING DIFFICULTY SECURING FUEL FOR CUPOLAS?

Let us give you data on the use of D & H Anthracite, compiled through actual tests in our own foundry over a period of many years. We invite your inquiry.

LACKAWANNA ANTHRACITE "the D&H"

THE HUDSON COAL COMPANY

SCRANTON • PENNSYLVANIA

Producers of D & H ANTHRACITE

A GREAT NAME IN FUEL

Tune in the "D & H ANTHRACITE MINERS"
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for Handling and Pouring

ALL METALS

TIMKEN-WORM GEARED LADLES

These patented ladles are designed by men with over 30 years of practical foundry experience.

They offer the utmost in Safety, Dependability, Long Life, Ease of Operation, Convenience, Economy and Simplicity.

They are manufactured in all types and sizes, and are arranged for manual or electrical operation.

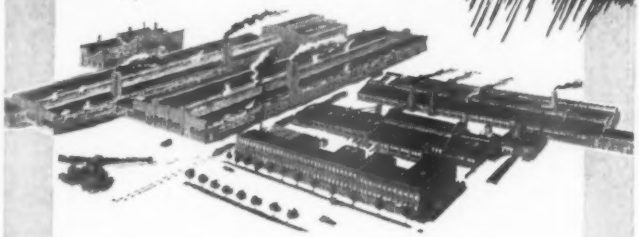
Our line of pouring and handling equipment is complete, including bowls, shanks, bails and tongs . . . special equipment.

INDUSTRIAL EQUIPMENT CO.

115 NORTH OHIO STREET • MINSTER, OHIO

Seventy Years of Service 1878 - 1948

MOLINE IRON WORKS 70 Years of Service 1878-1948



Celebrating Our 70th Birthday

For Seventy Years Quality has been tradition at the Moline Iron Works. Moline products are well known for durability and performance, and are made by men and women to whom the maintenance of high standards is a matter of great pride. Many of our employees have from 25 to over 50 years of service, and second and even third generations of some families are MIW family members. We salute the past and look forward to the future with thanks to our customers and friends who have made our growth and success possible.

Moline Iron Works Products
Hay Handling Equipment — Tackle Blocks — Wire Stretchers — Rope Hoists — Load Binders — Saddlery Hardware — Foundry Molding Machines — Wagon Hardware — Refined Malleable Castings — Clevises

MIW

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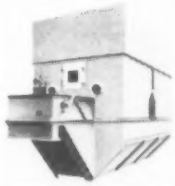
MOLINE IRON WORKS
MOLINE, ILLINOIS

Eats DUST *and* FUMES *from YOUR production*

Schmieg CENTRI MERGE DUST and FUME Eliminator

AUTOMATICALLY

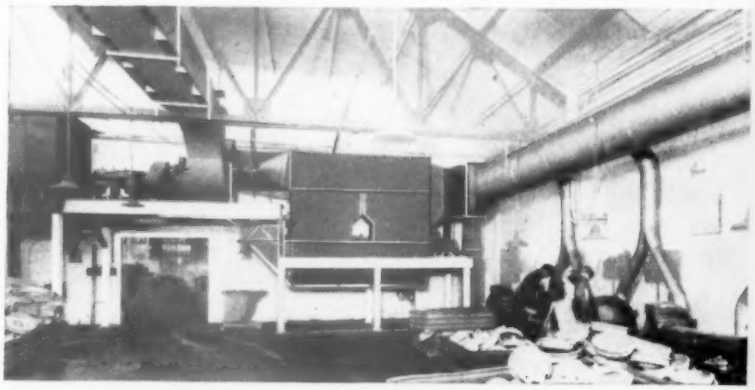
- **COLLECTS** —*at point of origination.*
- **CLEANS** —*by high pressure water action.*
- **DISPOSES** —*by mechanical conveyor in the form of sludge.*



Like a huge octopus, with its tentacles (ducts) reaching out to every working area where contamination of air occurs, the Schmieg CENTRI-MERGE Eliminator sucks up and consumes all dangerous dust and fumes—literally eats them up.

Picked up at the point of origination—BEFORE *any damage can be done*—dust and fumes ride an air stream through the ducts to the Collection Unit. Here CENTRI-MERGE goes into action—washing—scrubbing—pounding out the dust and dirt in a tornado of cleansing water. Dust particles are deposited—under water—in a sludge tank at base of Unit.

We welcome the opportunity of proving what CENTRI-MERGE can do for you.

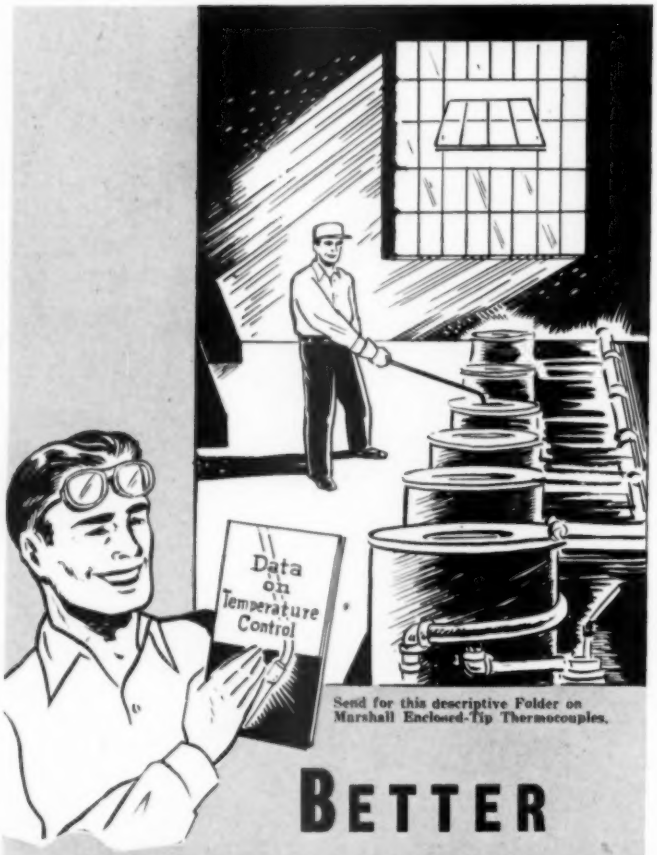


CENTRI-MERGE Collection Units are available in capacities to handle any air cleaning job—small or large. May be installed singly or in batteries, depending upon volume of air to be handled.

THE *best* AIR PURGE *is* CENTRI MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

302 PIQUETTE AVENUE • DETROIT 2, MICHIGAN



Send for this descriptive Folder on Marshall Enclosed-Tip Thermocouples.

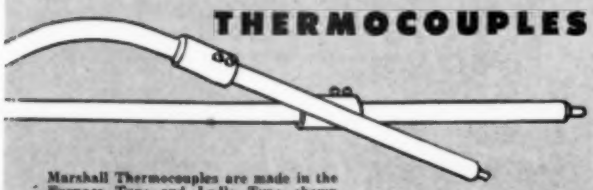
BETTER TEMPERATURE CONTROL

Temperature of molten metals must be checked frequently to assure proper casting results. This temperature reading must be definite and undelayed, and above all, reliable.

The difficulties often experienced in this operation are largely eliminated by the use of Marshall Enclosed-Tip Thermocouples. These Thermocouples have the sturdy, protected tip that lengthens the service life of the instrument.

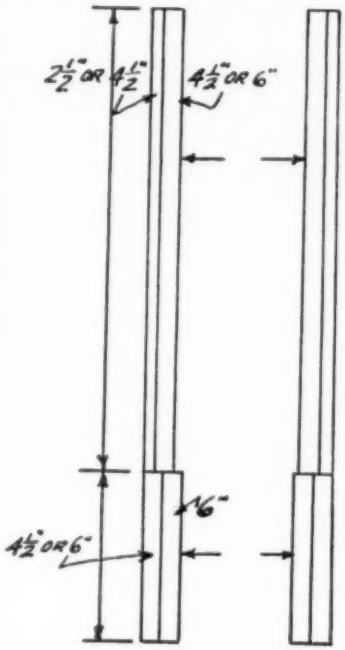
With Marshall Thermocouples, foundrymen save time, obtain predetermined temperatures, and standardize the quality of their castings. L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio.

MARSHALL THERMOCOUPLES



Marshall Thermocouples are made in the Furnace Type and Ladle Type shown above.

Special Shape Cupola Blocks and Series Fire Brick for all Diameters and Height Cupolas



Vertical section showing inner lining without disturbing outer lining. Mark in dimension and we will supply sketch and kind and quantity brick and clay required. Standard and SUPER cupola blocks and series.

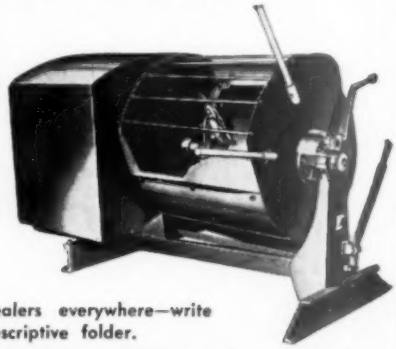
THE DAVIS FIRE BRICK CO.
OAK HILL, OHIO

MC MIXERS FOR THE FOUNDRY

Triple mixing hoes for thorough mixing—flared drum for quick, easy discharge. Available with gasoline engine, electric motor, or belt pulley.

THE LOW-COST METHOD FOR HANDLING—

- **FACING**
- **CORE SAND**
- **CUPOLA "MUD"**



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★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
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Copper Shot

IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service
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FOR DEPENDABILITY IN FOUNDRY PRODUCTION . . .

The UNITED Steel JACKET

Reinforcement Gusset
EXTRA STRENGTH

Cooling Vent
ELIMINATES WARPING

Sturdy Channel Construction
BUILT TO LAST

United steel jackets are designed and manufactured exclusively for foundrymen who demand a superior product for high production work . . . Unique channel construction assures extra strength and durability . . . New self-cooling double reinforcement at the parting line eliminates warping on runouts . . . All parts are electrically spot welded with additional arc welds at strategic points.

United's engineering service is always available for your more difficult problems.

★ MANUFACTURERS OF CUSTOM SNAP AND SLIP FLASKS ★

United Pattern Works
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For A Successful NEW YEAR Try WATERLOX PRODUCTS

Rising costs of both labor and material will have to be cut to meet competition. Such costs can be cut with the use of the WATERLOX LINE, a product for every Foundry need.

WATERLOX
CASTING SEALER and IMPREGNATOR

An effective sealer for castings from 6 ounces to 6000 lbs. Eliminates, rejects and reinforces the metal to a strength beyond its original.

WATERLOX
CEMENT FLOOR STAIN

Not a paint, not a dye—a true stain which becomes a part of the surface, itself. Colorful and durable.

WATERLOX
HADES ALUMINUM

A heat-resistant coating for ovens, furnaces, and other facilities requiring similar protection. Retains its original appearance after being heated to cherry-red.

WATERLOX PRODUCTS
include

FLAT WALL PAINT — ENAMELS
EXTERIOR COATINGS — FLOOR SEAL

Manufactured by

WATERLOX
DIVISION OF
THE EMPIRE VARNISH COMPANY
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THERE'S ROOM ALOFT

If ground is too limited to scatter materials all over the lot, there's room upwards for storage in Neff & Fry super-concrete stave silos. It's better anyway to store flowable bulk materials out of the weather.

The construction of Neff & Fry storage bins assures service for a generation or longer with virtually no upkeep expense. The super-concrete staves are dense, smooth, enduring. They interlock to form strong, tight joints. Each tier is bound with high-tension steel hoops.

Hundreds of N & F bins are in use for storing cement, chemicals, coal, fertilizer, grain, gravel, lime, sand, sawdust, seeds, water, wood pulp, and numerous other materials.

Would you like to have our catalog which tells the whole story? A copy is yours for the asking.

THE
NEFF & FRY
COMPANY
CAMDEN, OHIO

SUPER CONCRETE STAVE

NEFF & FRY STORAGE BINS

CUT HIGH LABOR COSTS

Get more for your labor dollars by cutting out slow, expensive hand methods of handling all bulk materials.

ROURA SELF-DUMPING HOPPERS

. . . cut labor time and fatigue in half. Easy to fill at source, move with any standard fork or platform lift truck, trip and let them automatically dump, right and lock, ready for another load. They are QUICK, SAFE, ECONOMICAL.

Write today for detailed bulletin "In Dollars & Sense" showing types and sizes for any job.

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QUALITY • DEPENDABILITY • SERVICE

Producers of

PressureProof

ANGELL

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CHAPLETS

and all types of nails

The Angell Nail

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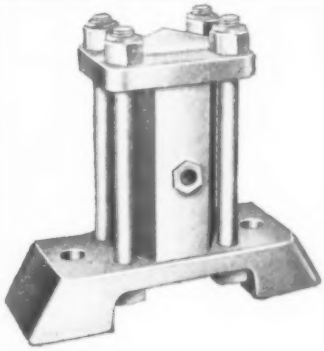


THROW AWAY THE SLEDGE!

FOR THOSE TROUBLESOME HOPPERS **INSTALL**

The Vibrator with the Kick **"BRANFORD"**

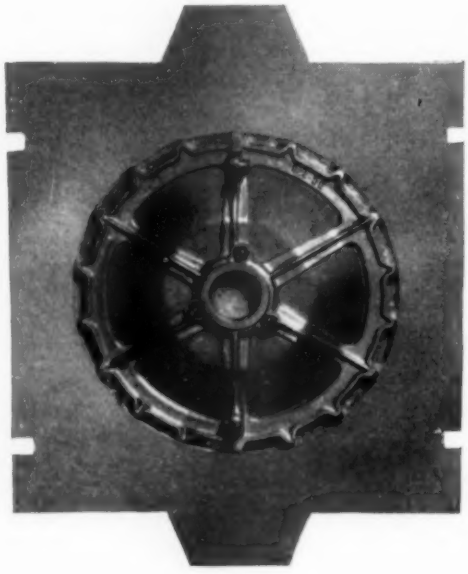
—A SIZE AND STYLE TO SUIT YOUR EVERY NEED—

INSTALLING A "BRANFORD" MEANS —

- Avoiding Damage To Hoppers & Bins
- Faster Molding Time
- Instant Even Flow of Sand
- Eliminating Poking and Sledging

1915 BRANFORD VIBRATORS U.S.A.

NEW HAVEN VIBRATOR CO.
130 CHESTNUT ST.
NEW HAVEN 7, CONN.



INCREASED PROFITABLE PRODUCTION AT LOWER COST WITH LESS SCRAP IS A POSITIVE AND DIRECT RESULT OBTAINED BY USING OUR PRESSURE CAST ALUMINUM MATCHPLATES, COPE & DRAG PLATES, COREBOXES AND LARGE DRIERS WHICH WE PRODUCE WITHOUT SIZE LIMITATIONS.

ONLY ONE MASTER PATTERN REQUIRED

ALLOW 1/8" PER FOOT FOR OUR SHRINKAGE

We shall be pleased to receive your request for quotations, delivery dates and layout forms. Immediate deliveries available in most cases.

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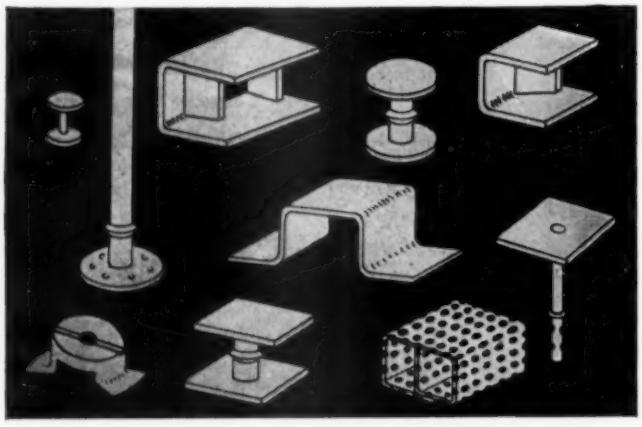
AFFILIATED PLANT LOCATIONS:

Birmingham, Alabama **Coffeyville, Kansas** **Menasha, Wisconsin**

Write us for information and details

There's always one Chaplet that's best for each job

ARE YOU SURE YOU'RE USING IT?



The large variety of "Buffalo" Chaplet designs enables you to meet your needs *exactly*. Given this broad selection, you are always assured of greater strength, easier burning-in and higher resistance to chilling for each specific job.

CATALOG NO. 14 offers complete details on designs, sizes and gauges. Copies mailed promptly. Samples of any "Buffalo" Chaplet will be gladly furnished.

Combined SUPPLY & EQUIPMENT CO., INC.
211 CHANDLER ST., BUFFALO 7, N. Y.

DOUBLE YOUR PRODUCTION—with the fastest and most powerful Rammer made—

NO. 4 DAYTON RING VALVE BENCH RAMMER

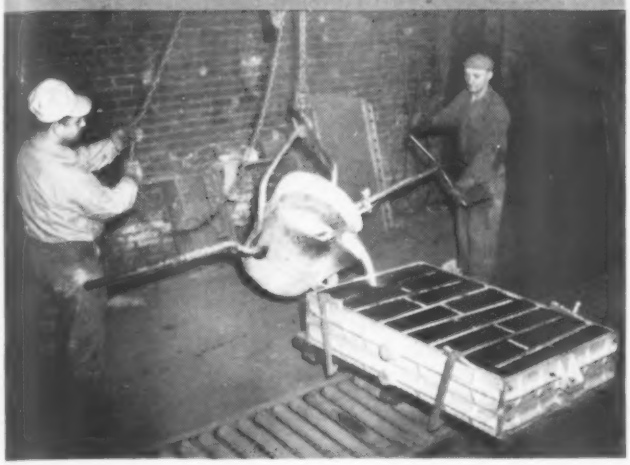
Aside from its efficiency, the chief advantage of this Rammer lies in its long life. The Valve Unit will last for years without repair or replacement. The Cylinder Bore and Piston Rod are HARD CHROME PLATED, features which double the life of the Rammer and reduce maintenance costs at least one-half.

Have been adopted as standard by some of the largest users of Rammers throughout the Country. MADE IN FIVE SIZES. Send for Bulletin No. 300.

DAYTON PNEUMATIC TOOL CO., DAYTON, O.

Magnesium Castings

increase efficiency and cut production costs!



UTICA engineers prove the economy and efficiency of Magnesium Castings in their own plant operations!

The many advantages of Magnesium Castings—increased production and efficiency, reduced costs and weight—are being utilized now by the Utica Radiator Corporation . . . *right in its own plant!* In the core room . . . in the foundry . . . experience is showing the wisdom of using this modern metal for modern production. Read the article, "Magnesium in Use in An Iron Foundry," by A. J. Marotta, Chief Metallurgist of Utica Radiator, in this issue of *The Foundry*. Let Utica engineers show you how to solve your problems with modern Magnesium Castings!

Facts you'll want to know about Magnesium Castings

Our new folder gives you the facts you'll want to know about Magnesium . . . and the story of our production facilities. You'll want this information at your fingertips!

Write for your copy today!

Utica Radiator Corporation

Manufacturers of Magnesium Castings for Industry

2260 Dwyer Avenue • Utica 2, New York

20th Century Blast

SHOT, GRIT

A SHORT-CUT TO HIGHER EFFICIENCY

A test points to Savings

EXPERIENCE IS THE BEST TEACHER. It eliminates guesswork in making decisions.

Therefore, we urge you to put 20th Century Blast Shot and Grit to the test. Like many other foundrymen you will be convinced that it is no ordinary blast-cleaning abrasive, but one that is highly essential for top cleaning room efficiency and economy.

20th Century Blast is an amazingly durable product, so hard, so tough that you can depend on it to hold to its size range longer and do a most effective cleaning job.

Complete range of sizes. IMMEDIATE SHIPMENT.

Write for Samples and Price.

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For

CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

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(Established 1905)

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SILVERY PIG IRON

A BLAST FURNACE PRODUCT

Smelted from Superior quality lake ores, high grade metallurgical coke and limestone, using our own local No. 1 Sharon Seam coal.

A "blend" with JISCO is sound metallurgy.

HIGH SILICON IRON JISCO

THE JACKSON IRON & STEEL Company
JACKSON, OHIO

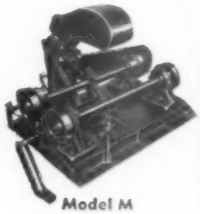
CENTRIFUGAL CASTING MACHINES

Model AS

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

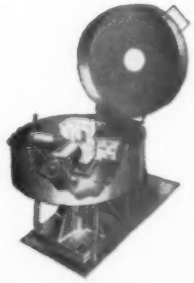
Model J

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.



Model M

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.



Model J-P

CENTRIFUGAL CASTING MACHINE COMPANY
Nathan Janco, *President*
P. O. Box 947 Tulsa 1, Okla.

IT'S NEW—IT'S SENSATIONAL

AMASTEEL

GENUINE ALLOY STEEL
SHOT & GRIT

LASTS MANY TIMES LONGER

Here at last is peak efficiency in Shot and Grit for blast CLEANING and PEENING. AMASTEEL SHOT and GRIT are far better than ordinary hard iron abrasives because they are TRUE ALLOY STEEL.

Compared to regular blasting materials, AMASTEEL offers an amazing superiority due to its long life and resistance to breakdown and greater CLEANING and PEENING speed. This feature means additional savings on labor, handling, storage, freight costs, and dust disposal.

AMASTEEL is produced under exclusive patents and is available in sizes that meet all CLEANING and PEENING requirements.

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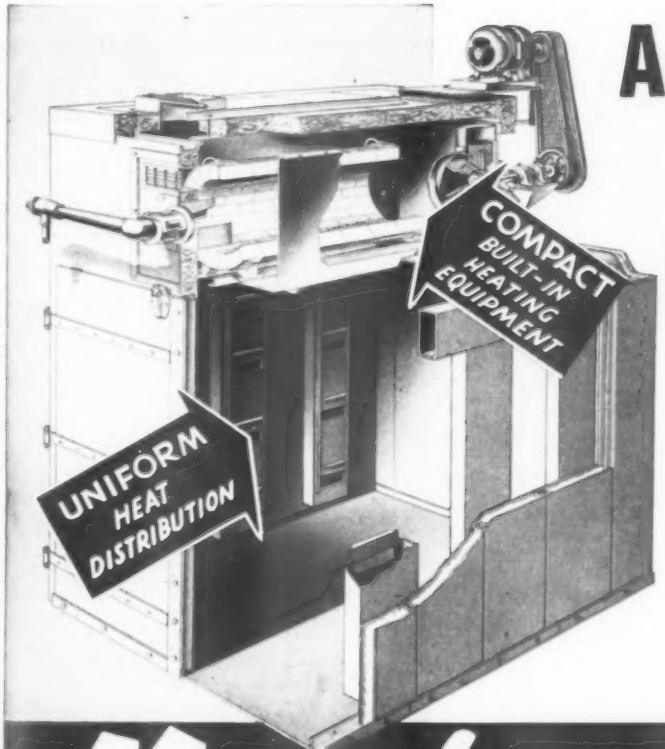

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The new MORRISON standard Oven is designed for core-baking, mold-drying, and similar applications requiring maximum uniformity obtained by forced convection of heated air.

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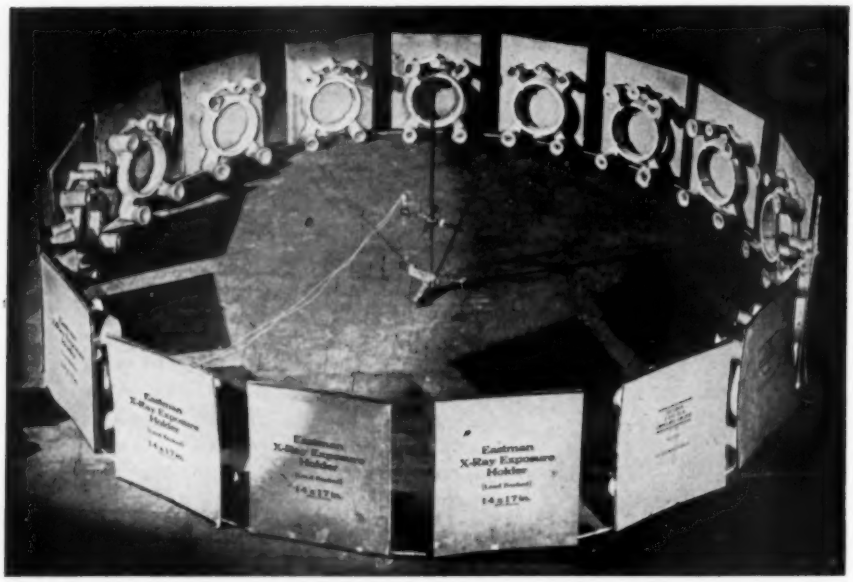

PHOTOGRAPH COURTESY OF CRANE CO.

"Directional solidification" can easily be studied by the set-up illustrated in the photograph—to indicate the best method of casting with a minimum of defects in the casting itself.

Radium has become a new foundry tool which directly effects an increase in yield. It permits accurate determination of the proper procedure in gating and risering "tough" castings. Seventeen cylindrical castings were radiographed simultaneously by Crane Co. to ascertain the most productive and economical foundry practice.

Radium thus performs a valuable additional function.

For inspection, for determination of directional solidification, Radium is available in capsules of various unit strength in duralumin holders which may be leased or purchased at low rates.

The rental includes full coverage insurance; heavy load storage containers and slide rule exposure calculators.

Write us concerning any problem of Gamma Ray Radiography

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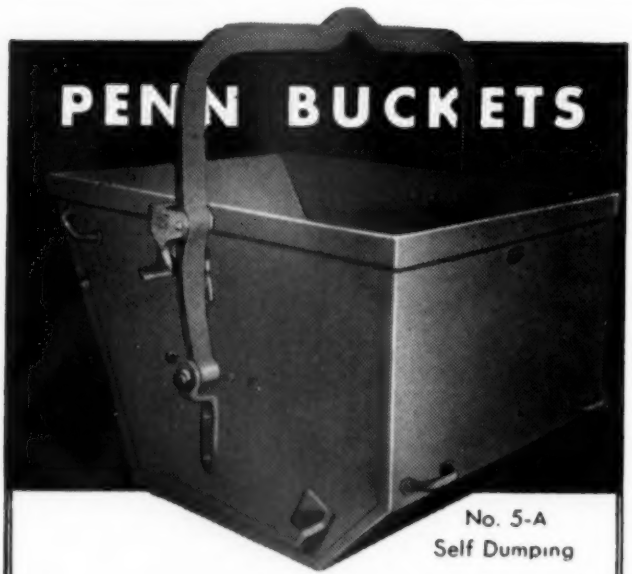

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FULLY EQUIPPED

● The post and squeeze cylinder on the HAYNES JOLT SQUEEZER is cast all in one piece. There are no bolts or screws in this machine. The top of the post is machined on top with a 2 7/16" cold rolled shaft which the swing arm swings on.

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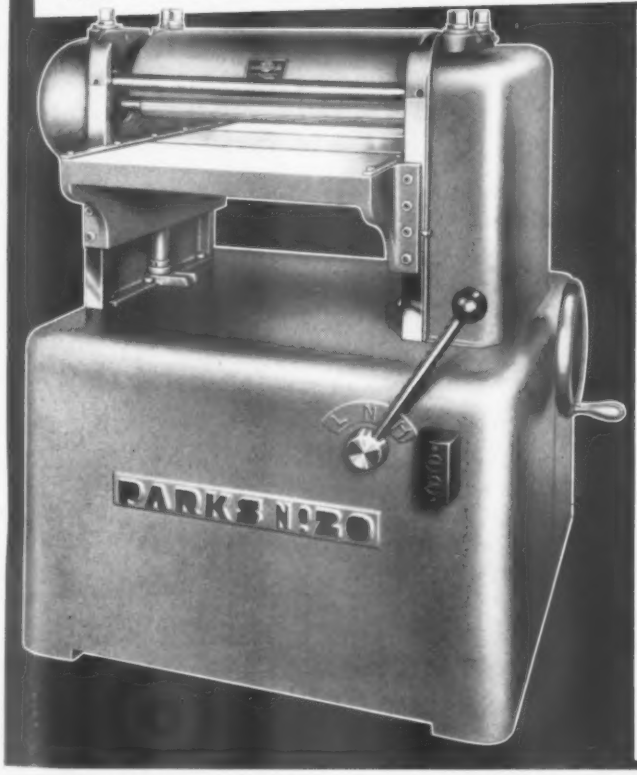

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Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for pattern shops and all industrial plants requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds—20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.

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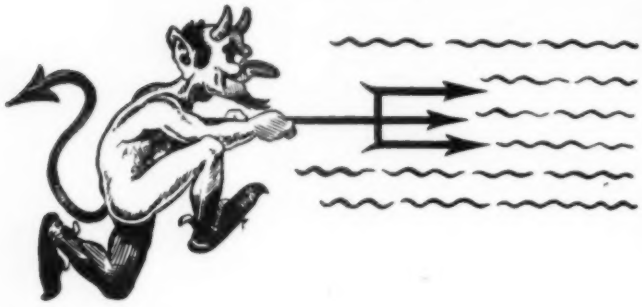
SOFFEL'S THERMOTOMIC ABC

(Patents Pending)



An Exothermic Metal Feeding Compound for Aluminum and Magnesium Castings

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THERMOTOMIC ABC is the first successful exothermic feeding compound ever to be developed for aluminum and magnesium castings. Results obtained from its use are amazing. Feeding metal in heads or risers is maintained in the fluid state for 20 to 30 minutes. Yield on aluminum castings has been increased by as much as 120%. Great savings are effected through reduced riser dimensions. Feeding heads or risers are reduced in volume 80% and more, and their removal from the casting is greatly facilitated due to the restricted feeding necks.

THERMOTOMIC ABC is used as feeding ring cores under feeding heads or risers at their juncture with the casting. When the molten aluminum comes into contact with the exothermic ring core or insert, an exothermic chemical reaction takes place in the material which generates an intense heat. This heat serves to increase the temperature of the metal in the feeding head, thus assuring that it will remain fluid longer than the metal in the main body of the casting. As the casting cools and solidifies, the reservoir of feeding metal in the heads is free at all times to feed the casting and compensate for shrinkage occasioned by solidification. Since, by the use of THERMOTOMIC ABC, it is possible to control directional solidification in the casting, chills may be eliminated. Thin sections will feed from heavier sections; which in turn will feed from the feeding heads or risers. As the feeding heads or risers are kept liquid by the exothermic action of the THERMOTOMIC ABC, it is readily seen how this use of THERMOTOMIC ABC will eliminate shrink cracks and pipe in castings caused by premature freezing of the feeding metal.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

SOFFEL'S AL-X31 LIQUIDIZER

(Patents Pending)

An Exothermic Feeding Head Compound and Pipe Eliminator For Aluminum and Magnesium Castings

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

SOFFEL'S AL-X31 LIQUIDIZER was developed for use in conjunction with THERMOTOMIC ABC. In order to secure best results and maximum feeding, we strongly recommend that AL-X31 LIQUIDIZER be applied on the feeding heads or risers. When so applied, AL-X31 LIQUIDIZER enters into an intense exothermic action which will actually raise the temperature of the feeding metal. The heat produced is sufficiently great that, even if the metal has solidified, it will re-melt. After AL-X31 LIQUIDIZER has completed its exothermic action, it forms a soft, insulating cover on the feeding metal. This cover confines the heat generated and further delays solidification of the feeding heads or risers.

SOFFEL'S AL-X31 LIQUIDIZER, when applied on the metal in holding pots or ladles, will maintain the temperature of the metal and prevent loss of heat to the atmosphere through radiation. This is especially important in cases where considerable time may elapse between filling the ladles and finishing pouring of the molds. The exothermic action of the AL-X31 LIQUIDIZER will effectively prevent freezing up of the metal in the ladles, even if the metal is too cold on removal from the furnace. Since the use of AL-X31 LIQUIDIZER in the ladles will actually increase the temperature and fluidity of the metal, cold-shuts and misruns in this section of castings are reduced or eliminated altogether.

NOTE: Neither THERMOTOMIC ABC nor AL-X31 LIQUIDIZER will contaminate or otherwise injure the metal in any way.

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Manufacturers of

Fluxes and Purifiers for all Metals and Alloys; also Soffel's Thermotomic Compounds and Soffel's Carbon-Free Liquidizers for Ferrous and Other Non-Ferrous Metals

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BLACKENING REACHES HIDDEN POCKETS
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PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
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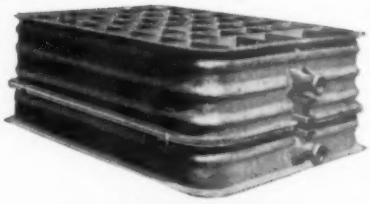

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FEDERAL BLAST NOZZLES ARE MADE OF
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"The hardest material known to man." For this reason they outwear ordinary nozzles in use for sand blasting and metal cleaning by the blast method. Air consumption is reduced and the blast is *concentrated* because the hole in the nozzle wears very slowly. This means low cost operation.

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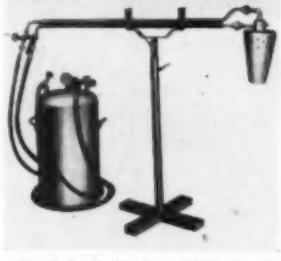

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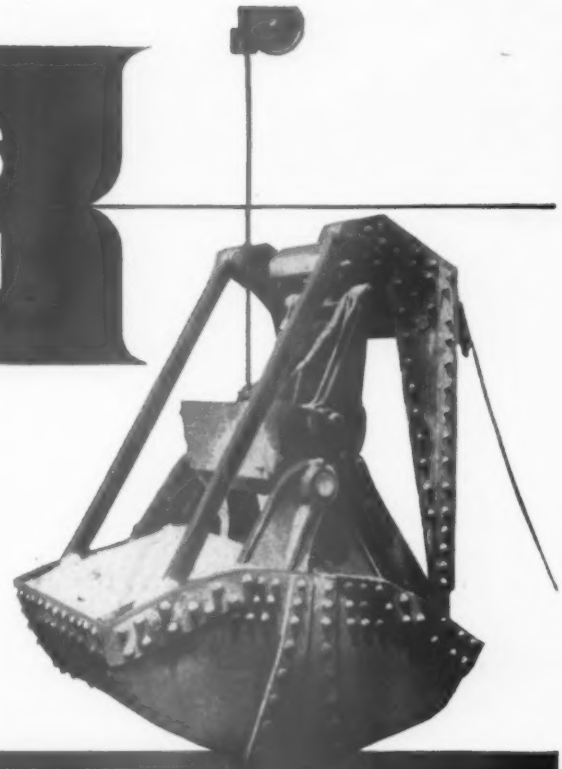
JUST 6 FEET 7 INCHES OPERATING HEADROOM



You may not require a bucket of such extremely low headroom, but if you do, Blaw-Knox makes it. It's just one of many designs particularly suited to foundry conditions which are illustrated and fully described in *Catalog 2002*. Your request will bring a copy by return mail.

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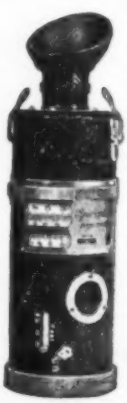

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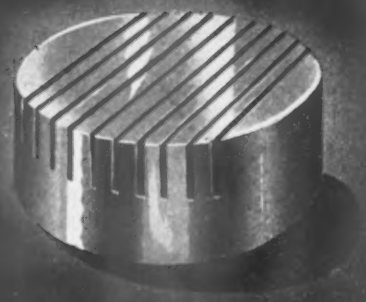

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Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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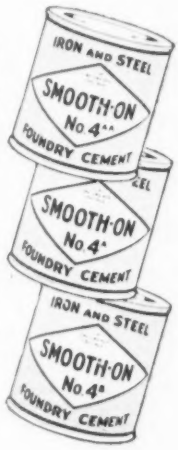

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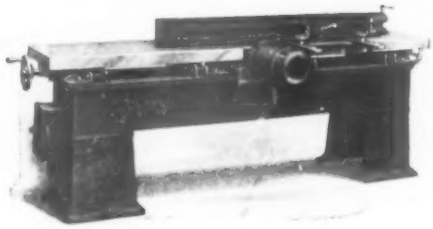
Do it with **SMOOTH-ON**
FOUNDRY CEMENT

"OLIVER" No. 166
HAND PLANER & JOINTER



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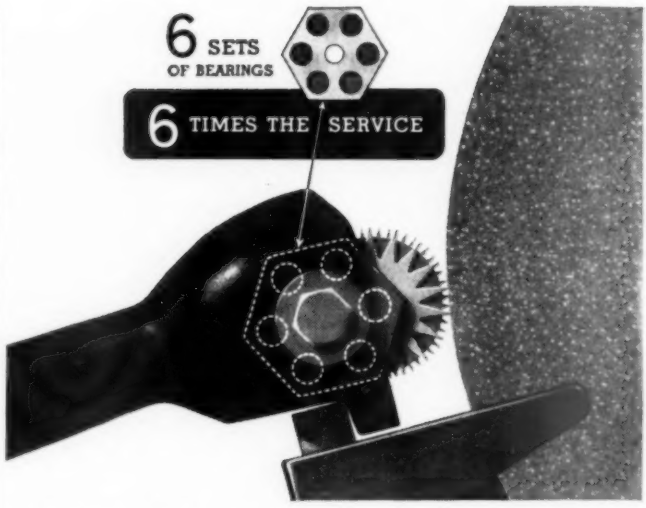

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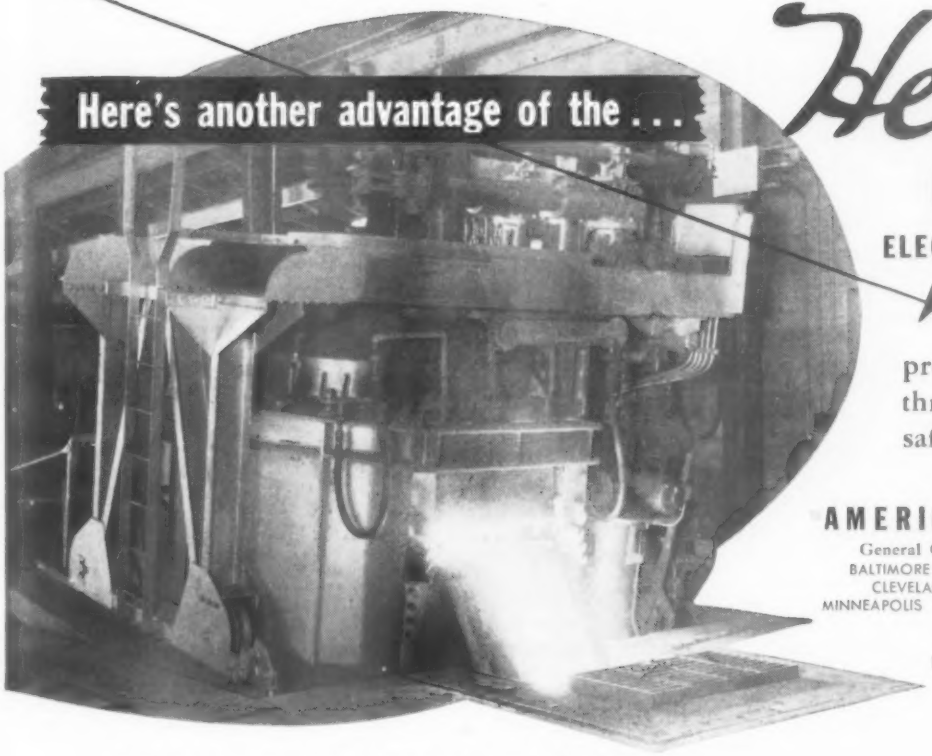

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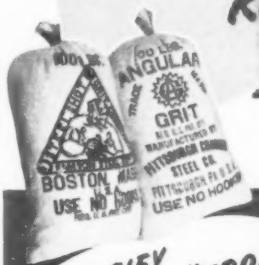

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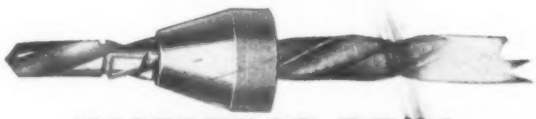

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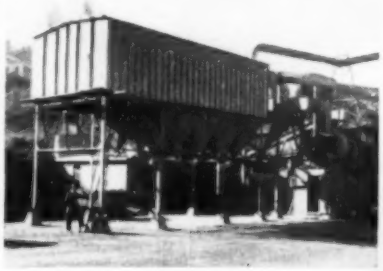

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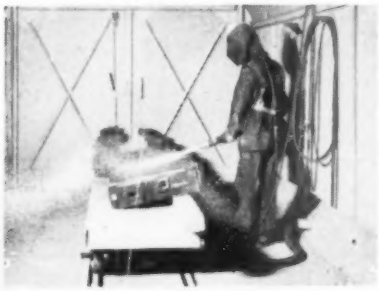

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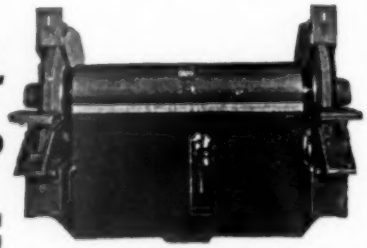

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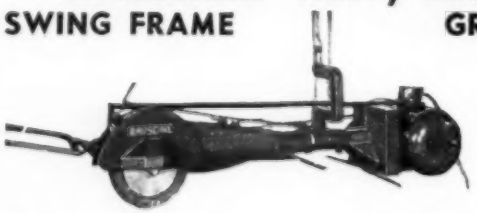

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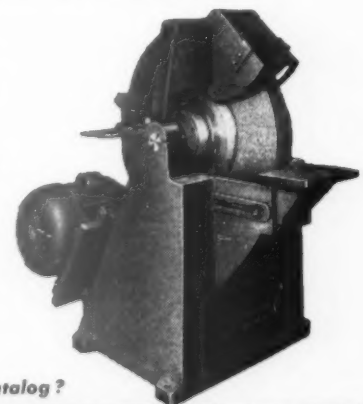

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Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York City 4.
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Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

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CRANES (Hand Traveling)

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Jib)

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail)

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Conco Engineering Works, Mendota, Illinois
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.

CRANES (Self-Propelled)

Hughes-Keenan Co., Mansfield, Ohio

CRUCIBLES

Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
National Crucible Co., Mermaid Lane and Queen Sts., Philadelphia 18, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE FURNACES

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.

CRUCIBLE LIFTERS

Hutchinson Co., Edwardsville, Ill.
Modern Equipment Co., Port Washington, Wis.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Simplicity Engineering Co., Durand, Mich.

CUPOLAS

Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Harnischfeger Corp., Milwaukee 14, Wis.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Carman, Edwin S., Lee Rd., at Mayfield, Cleveland 18, O.
Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA LININGS

Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.
United States Graphite Co., Saginaw, Mich.

CUPOLA SPARK ARRESTORS

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Chicago, Ill.

CUTOFF MACHINES (Abrasive)

Clipper Mfg. Co., 2800 Warwick St., Kansas City 8, Mo.
Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Wadsworth Equipment Co., Akron, Ohio.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

DEGASIFIERS

Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.

DEOXIDIZERS

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
Ajax Metal Co., 46 Richmond St., Philadelphia 23, Pa.
American Smelting & Refining Co., 120 Broadway, New York 5.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.

DEOXIDIZERS (Ferrous)

Carborundum Co., Perth Amboy, N. J.

DESULPHURIZERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N. Y.
Modern Equipment Co., Port Washington, Wis.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Miller-Taylor Tool Co., 5005 Euclid Ave., Clevelad 3, Ohio.

DIES

Acme Aluminum Alloys Inc., 232 North Findlay St., Dayton 3, Ohio.
Alumicast Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

DIRECT FIRED HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

DRILLS (Electric)

Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Schramm Inc., West Chester, Pa.

DRIVES (Reciprocating)

Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Magnetic)

Dings Magnetic Separator Co., 4720 W. McGeough, Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

DUMP HOPPERS

Buda Company, Harvey, Ill.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Bell Aircraft Corp., Niagara Falls, N. Y.
Phillips Mine & Mill Supply Co., 2227 Jane St., Pittsburgh 3, Pa.

DUST ARRESTING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Schneible Co., Claude B., 2827-25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.
Goergen Machwirth Co., Inc., 817 Sycamore St., Buffalo, N. Y.
Schmieg Industries, 6560 Cass Ave., Detroit 2, Mich.

DUST COLLECTORS (Shake-out)

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

DUST REMOVAL SYSTEMS

U. S. Hoffman Machinery Corp., 105 4th Ave., New York 17, N. Y.

ELECTRIC FURNACES (See Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS

Standard Conveyor Co., North St. Paul 9, Minn.

ELEVATORS (Bucket)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.

ELEVATORS (Material Handling)

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

ELEVATORS (Pneumatic, Material Handling)

Fuller Company, Catasaqua, Pa.

ENGINEERING SERVICE (Foundry)

Carman, Edwin S., Lee Rd. at Mayfield, Cleveland 18, O.
Engineering Service Inc., 610 West Michigan St., Milwaukee 3, Wis.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Chas. C. Kawin Co., 431 S. Dearborn St., Chicago 5, Ill.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
A. H. Putnam Co., 1319 2nd Ave., Rock Island, Ill.
Reichert, W. O., Engineering Co., 1060 Broad St., Newark, N. J.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.
Wickland Co., A. A., 205 W. Wacker Dr., Chicago 6, Ill.

ENGINEERING SERVICE (Permanent Mold)

Alumicast Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

EXHAUST SYSTEMS

American Air Filter Co., Inc., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corporation, Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Propellair Inc., Springfield, O.
Schmeig Industries, 6560 Cass Ave., Detroit 2, Mich.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FABRICATORS (Metal)

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stevens Inc., Frederic B., Detroit 26, Mich.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

FANS

General Blower Co., Morton Grove, Ill.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, O.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FERROBORON

Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROMANGANESE

Bethlehem Steel Co., Bethlehem, Pa.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N.Y.
Ohio Ferro-Alloys Corp., Canton 2, O.

FERROMOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co., Jackson, Ohio.
Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Sales Corp., 30 E. 42rd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILLET (Wax, leather, wood)

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FINISHING EQUIPMENT

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.

FIRE BRICK

Carborundum Co., Perth Amboy, N. J.
Davis Fire Brick Co., Oak Hill, Ohio.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Norton Co., Worcester 6, Mass.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.
Stevens Inc., Frederic B., Detroit 26, Mich.
Chas. Taylor Sons Co., P.O. Box 58, Annex Sta., Cincinnati, Ohio.

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.

FIRE CLAY (Cont'd.)

Ironton Fire Brick Co., Ironton, O.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.
Chas. Taylor Sons Co., P.O. Box 58, Annex Sta., Cincinnati, Ohio.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, Ohio.

FLASK BUSHINGS

Hines Flask Co., 1324 Hird Ave., Cleveland 7, Ohio.
Universal Engineering Co., Frankenmuth, Mich.
Wadsworth Equipment Co., Akron, Ohio.

FLASK PINS

Diamond Clamp & Flask Co., Richmond, Ind.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, Ohio.
Universal Engineering Co., Frankenmuth, Mich.
Wadsworth Equipment Co., Akron, Ohio.

FLASKS (Aluminum)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Wadsworth Equipment Co., Akron, Ohio.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

FLASK FILLERS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Wadsworth Equipment Co., Akron, Ohio.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Stevens, Inc., Frederic B., Detroit 26, Mich.
United Pattern Works, 2309 Russell St., Detroit 7, Mich.

FLASKS (Steel)

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK FITTINGS

Adams Co., Dubuque, Iowa.
Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.
Wadsworth Equipment Co., Akron, Ohio.

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.

FLEXIBLE SHAFT MACHINERY

Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Strand Co., N. A., 5001 N. Wolcott Ave., Chicago 40, Ill.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

Carbon Limestone Co., Youngstown, Ohio.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY COAL (Anthracite)

Hudson Coal Co., Scranton, Pa.

FOUNDRY LAYOUT & METHODS

Engineering Service Inc., 610 West Michigan St., Milwaukee 3, Wis.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

FOUNDRY NAILS

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SYSTEMS

Engineering Service Inc., 610 West Michigan St., Milwaukee 3, Wis.

FOUNDRY SUPPLY HOUSES

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundries Materials Co., Coldwater, Mich.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Stevens, Inc., Frederic B., Detroit 26, Mich.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Despatch Oven Co., Minneapolis 14, Minn.

FURNACES (Annealing)

Campbell-Hausfeld Co., Harrison, Ohio.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
56 Church St., New York 7, N. Y.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Eclipse Fuel Engrg. Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.

FURNACES (Electric Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Greene Electric Furnace Co., 2702—6th So., Seattle 4, Wash.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Denver Fire Clay Co., 2301 Blake St., Denver, Colo.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.

FURNACES (Heat Treating) (Cont'd.)

Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit 7, Mich.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
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Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, O.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Frederic B. Stevens, Inc., Detroit 26, Mich.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

PATTERN COATINGS

American Lacquer Solvents Co., Phoenixville, Pa.
P.M.S. Co., 1701 Power Ave., Cleveland 14, Ohio.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

PATTERN COMPOUND

Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

PATTERN LETTERS

Freeman Supply Co., Toledo 5, O.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

PATTERN LUMBER

Dougherty Lumber Co., Cleveland 5, O.
Freeman Supply Co., Toledo 5, O.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.

PATTERN PLASTERS

United States Gypsum Co., 300 W. Adams St., Chicago, Ill.

PATTERN PLATES

Acme Aluminum Alloys Inc., 232 North Findlay St., Dayton 3, Ohio.
Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3.
P.M.S. Co., 1701 Power Ave., Cleveland 14, Ohio.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.
Wadsworth Equipment Co., Akron, Ohio.
Wellman Bronze & Aluminum Co., 2525 E. 93rd St., Cleveland 4, Ohio
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

PATTERN PLATE STOCK

Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

PATTERN SHOP EQUIPMENT

Do All Company, Des Plaines, Ill.
Freeman Supply Co., Toledo 5, O.
Heston & Anderson, Fairfield, Iowa.
Oliver Machinery Company, Grand Rapids 2, Mich.
Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23, Ohio.
Strand, N. A., Co., 5001 Wolcott Ave., Chicago 10, Ill.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

PATTERNS

Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Pressure Cast Products Co., 1028 Vermont Ave., Detroit 16, Mich.

PATTERNS (Wood, Metal)

Acme Aluminum Alloys Inc., 232 North Findlay St., Dayton 3, Ohio.
Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.
Pressure Cast Products Co., 1028 Vermont Ave., Detroit 16, Mich.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Wellman Bronze & Aluminum Co., 2525 E. 93rd St., Cleveland 4,Ohio.

PERMANENT MOLDS

Alumicast Corp., 1515 No. Kilpatrick, Chicago 51, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.
Wadsworth Equipment Co., Akron, Ohio.

PHOTOGRAPHIC EQUIPMENT

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

PHOTOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.

PHYSICAL TESTING
Wolverine Chemical Co., St. Joseph, Michigan.

PIG CASTING MACHINES
Wm. M. Bailey Co., Pittsburgh, Pa.

PIG IRON
Globe Iron Co., Jackson, O.
Jackson Iron & Steel Co., Jackson, Ohio.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Pickands, Mather & Co., Cleveland 14, O.
Woodward Iron Co., Woodward, Ala.

PIG IRON (Silvery)
Globe Iron Co., Jackson, O.
Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 322 S. Michigan Ave., Chicago 4, Ill.

PINS (Flask)
Diamond Clamp & Flask Co., Richmond, Ind.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

PISTON RINGS (for Molding Machines, Compressors, etc.)
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.

PLANT ENGINEERING SERVICE
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

PLASTER of PARIS
United States Gypsum Co., 300 W. Adams St., Chicago, Ill.

PLATES (Bottom)
Adams Co., Dubuque, Iowa
Christiansen Corp., 1 North LaSalle St., Chicago 2, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

PLATES (Core Drying)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Christiansen Corp., 1 North LaSalle St., Chicago 2, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Johns-Manville, 22 East 40th St., New York City 16.

PLUMBAGO
Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 26, Mich.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

PNEUMATIC TOOLS
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dallet Co., 165 West Clearfield, Philadelphia, Pa.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm Inc., West Chester, Pa.

POLISHING MACHINERY
Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.
Strand, N. A., Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

POURING DEVICES
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

POWDERED COAL EQUIPMENT
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

PRESSER BOARDS
Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Christiansen Corp., 1 North LaSalle St., Chicago 2, Ill.

PRESSURE CASTING SEALER
Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

PULLEYS (Magnetic)
Dings Magnetic Separator Co., 4740 W. McGeough, Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

PUMPS
Construction Machinery Co., Waterloo, Iowa.
Gardner-Denver Co., Quincy, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Dry, Vacuum)
Fuller Company, Catasauqua, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

PURIFIERS
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

PUSH-OFF MACHINES
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co., 1314 West 21st St., Chicago 8, Ill.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.

PUTTY (Foundry)
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

PYROMETERS
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 9, Ill.
Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.
Pyrometer Instrument Co., 106 Lafayette St., New York 13.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

RADIOGRAPHY (Industrial)
Eastman Kodak Co., Rochester, N. Y.
Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.
Wolverine Chemical Co., St. Joseph, Michigan.

RADIUM
Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

RAMMERS
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.

RAPPING PLATES
Diamond Clamp & Flask Co., Richmond, Ind.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

REFRACTORIES
Carborundum Co., Niagara Falls, N. Y.
Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.
Davis Fire Brick Co., Oak Hill, Ohio.

REFRACTORIES (Cont'd.)
Denver Fire Clay Co., 2301 Blake St., Denver, Colo.
Eastern Clay Products, Inc., Jackson, O.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, O.
National Crucible Co., Mermaid Lane and Queen Sts., Philadelphia 18, Pa.
Norton Co., Worcester 6, Mass.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.
Chas. Taylor Sons Co., P.O. Box 58, Annex Sta., Cincinnati, Ohio.
United States Graphite Co., Saginaw, Mich.

REFRACTORY BREAKER CORES
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

REPAIR PARTS (Molding Machine)
Pioneer Mfg. Co., West Allis, Wis.

RESPIRATORS
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Wilson P. [illegible]ts Inc., Reading, Pa.

RIDDLES
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

RIDDLES (Electric)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kans.

RIDDLES (Hand)
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

ROD DIP
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.

ROD STRAIGHTENERS
American Wheelabrator & Equipment Co., Mishawaka, Ind.

ROLLER-HEARTH FURNACES (Electric Annealing)
General Electric Co., Schenectady, N. Y.

RUBBER LINING MATERIAL (Abrasive Resisting)
Pangborn Corp., Hagerstown, Md.

SAFETY CLOTHING
American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

SALT and SALT TABLETS
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

SAND (Core, Molding, Blasting)
Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O. 232 North Findlay St.,
Ottawa Silica Co., Ottawa, Ill.
Pangborn Corp., Hagerstown, Md.
Producers Core Sand Corp., Michigan City, Ind.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SAND BLAST BARRELS
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.

SANDBLAST BARRELS (Cont'd.)
Pangborn Corp., Hagerstown, Md.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

SAND BLAST CABINETS
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

SAND BLAST EQUIPMENT
American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

SAND BLAST NOZZLES
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Norton Company, Worcester 6, Mass.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., 4753 Train Ave., Cleveland 2, O.

SAND BLAST ROOMS
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

SAND BLAST TABLES
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

SAND CONDITIONERS
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

SAND CONTROL & TESTING EQUIPMENT
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND CONVEYING and HANDLING EQUIPMENT
American Air Filter Co., Louisville 8, Ky.
C. O. Bartlett & Snow Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Clearfield Machine Co., Clearfield, Pa.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Penn Iron Works, Reading, Pa.
Royer Foundry & Machine Co., Kingston, Pa.

SAND CONVEYING and HANDLING EQUIPMENT (Pneumatic)
Ajax Flexible Coupling Co., Westfield, N. Y.
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.
Fuller Company, Catasauqua, Pa.
Frank G. Hough Co., Libertyville, Ill.
Godfrey Conveyor Co., Elkhart, Ind.
Robins Conveyors Inc., 70 Pine St., New York 5, N. Y.

SAND COOLING SYSTEMS
Newaygo Engineering Co., Newaygo, Mich.

SAND DRYERS
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Nichols Engineering & Research Corp., 60 Wall Tower, New York 5, N. Y.

SAND ENGINEERING SERVICE
Minco Products Corp., Saginaw, Mich.

SANDERS (Tapered-Spindles)
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

SANDING MACHINERY
Oliver Machinery Company, Grand Rapids 2, Mich.

SAND MEASURING and WEIGHING DEVICES
Baker Perkins Inc., Saginaw, Mich.
Link Belt Co. 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND MIXERS
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Corp., Waterloo, Iowa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.

SAND PREPARATION EQUIPMENT
Ajax Flexible Coupling Co., Westfield, N. Y.
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Clearfield Machine Co., Clearfield, Pa.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Moulders Friend, Dallas City, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Royer Foundry & Machine Co., Kingston, Pa.
Screen Equipment Co., Buffalo 21, N. Y.
Simplicity Engineering Co., Durand, Mich.

SAND RAMMERS
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

SAND RECLAIMERS
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND RECLAIMERS (Cont'd.)
Nichols Engineering & Research Corp., 60 Wall Tower, New York 5, N. Y.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SAND SIFTING and SCREENING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.
Screen Equipment Co., Buffalo 21, N. Y.
Simplicity Engineering Co., Durand, Mich.
Pangborn Corp., Hagerstown, Md.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

SAND STORAGE BINS & GATES
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Neff & Fry Co., Camden, O.

SAWS (Band, Metal, Wood)
Atlantic Saw Mfg. Co., New Haven, Conn.
Do All Company, Des Plaines, Ill.
Oliver Machinery Company, Grand Rapids 2, Mich.
Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23, Ohio.

SAWS (Cold Metal)
Bethlehem Steel Co., Bethlehem, Pa.
Do All Company, Des Plaines, Ill.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SAWS (Masonry)
Clipper Mfg. Co., 2800 Warwick St., Kansas City 8, Mo.

SCALING HAMMERS
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm, Inc., West Chester, Pa.

SCREENS (Shake-Out)
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
C. O. Bartlett & Snow Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Screen Equipment Co., Buffalo 21, N. Y.
Simplicity Engineering Co., Durand, Mich.

SCREENS (Vibrating)
Ajax Flexible Coupling Co., Westfield, N. Y.
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Robins Conveyors, Inc., 70 Pine St., New York 5, N. Y.
Screen Equipment Co., Buffalo 21, N. Y.
Simplicity Engineering Co., Durand Mich.

SCREW MACHINE PRODUCTS
Wellman Products Co., 1444 E. 49th St., Cleveland 3, O.

SEA COAL
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, O.
Frederic B. Stevens, Inc., Detroit 26, Mich.

SEPARATORS (Abrasive)
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

SEPARATORS (Air, Moisture, Oil)
American Air Filter Co., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Jas. A. Murphy & Co., Hamilton, O.
Pangborn Corp., Hagerstown, Md.

SEPARATORS (Magnetic)
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Dings Magnetic Mfg. Co., 4740 W. McGeough, Milwaukee 7, Wis.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SHAKE-OUT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
C. O. Bartlett & Snow Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Robins Conveyors, Inc., 70 Pine St., New York 5, N. Y.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.

SHAKEOUT MACHINE MOUNTING PADS
Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

SHOCK ABSORBING PADS
Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

SHOES (Safety)
Titan Safety Shoe Co., 212 Essex St., Boston 11, Mass.

SHOT AND GRIT
Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Steel Shot & Grit Co. Inc., 39 Warren Ave., Boston, Mass.

SHOT (Peening)
Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co. Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.

SHOT (Peening) (Cont'd.)
Globe Steel Abrasive Co., Mansfield, Ohio.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOVELS
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 26, Mich.

SHOVELS (Power)
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

SILICA FLOUR
Ottawa Silica Co., Ottawa, Ill.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SILICON (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

SILICON CARBIDE (Briquets)
Carborundum Co., Perth Amboy, N. J.

SILVERY PIG IRON see Pig Iron (Silvery)

SKIMMER BARS
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

SKIMMERS
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

SKIP HOISTS
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Gardner-Denver Co., Quincy, Ill.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

SLIP FLASKS
Adams Co., Dubuque, Iowa.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

SLINGS (Chain)
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
S. G. Taylor Chain Co., Hammond, Ind.

SLIP JACKETS
Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

SMELTERS & REFINERS
American Smelting & Refining Co., 120 Broadway, New York 5.
Christiansen Corp., 1 North LaSalle St., Chicago 2, Ill.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.

SNAGGING WHEELS—See ABRASIVE WHEELS

SNAP FLASKS
Adams Co., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

SODA ASH
Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N.Y.

SOLDER
American Smelting & Refining Co., 120 Broadway, New York 5.

—When writing advertisers, please mention THE FOUNDRY—

SPACE HEATERS
Dravo Corporation, Neville Island, 8 East 44th St., New York 17.

SPECIAL FOUNDRY ALLOYS
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

SPRAY GUNS
Murphy & Co., Jas. A., Hamilton, O.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

SPRUE CUTTERS
Adams Co., Dubuque, Iowa.
Freeman Supply Co., Toledo 5, O.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

STEEL (High Speed)
Bethlehem Steel Co., Bethlehem, Pa.

STEEL (Structural)
Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
American Bridge Co., Pittsburgh 19, Pa.

STRIPPING MACHINES
Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

SURFACE TREATMENT METALS
N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

TAPER PINS
Standard Horse Nail Corp., New Brighton, Pa.

TEMPERATURE CONTROLLERS
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.

TESTING EQUIPMENT
Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

TESTING LABORATORIES
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

TESTING MACHINES (Tensile)
Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

THERMOCOUPLES
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

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Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TIMERS (Electric)
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

TIN
American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.

TONGS
Industrial Equipment Co., Minster, O.

TOOLS, CUTTING (Carbide)
Severance Tool Industries Inc., Saginaw, Mich.

TOOLS (Pneumatic Portable)
Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, O.
Gardner-Denver Co., Quincy, Ill.

TOOLS (Pneumatic, etc.) (Cont'd.)
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.

TORCHES and BURNERS (Acetylene, gas, oil)
Freeman Supply Co., Toledo 5, O.
Linde Air Products Co., 30 E. 42nd St., New York 17.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

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TRACTOR (Gas Powered)
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TRAMRAIL SYSTEMS
American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

TROLLEYS
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St Louis 20, Mo.
Modern Equipment Co., Port Washington, Wis.

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Electric Storage Battery Co., Allegheny Ave. at 19th St., Philadelphia 3, Pa.

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Hughes-Keenan Co., Mansfield, Ohio.

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Phillips Mine & Mill Supply Co., 2227 Jane St., Pittsburgh 3, Pa.

TRUCKS (Industrial)
Buda Company, Harvey, Ill.

TRUCKS (Power Lift)
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TRUCK WHEELS
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TUBES (X-RAY)
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

TUMBLING BARRELS
Cleveland Chaplet & Mfg. Co., 1197 West 67th St., Cleveland 2, O.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
N. Ransohoff Inc., 208 W. 71st St., Cincinnati 16, O.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Modern Equipment Co., Port Washington, Wis.
Newaygo Engineering Co., Newaygo, Mich.
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UNIT HEATERS
Dravo Corp., Neville Island, Pittsburgh 25, Pa.

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Bosworth Engineering Co., 6723 Denison Ave., Cleveland, Ohio.

VALVES (Air, Water, Steam)
Air-Way Pump & Equipment Co., 405 S. Jefferson St., Chicago 7, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

VALVES (Air, Water, Steam) (Cont'd.)
Flex Rite Valve & Mfg. Co., Tulsa 3, Oklahoma.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

VALVES (Adjustable Orifice)
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, Ohio.

VALVES (Blow-off and Cut-off)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Wm. H. Nichols Co., Richmond Hill, Long Island 18, N. Y.

VENTILATING SYSTEMS
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.
Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

VENTILATORS (Roof)
Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

VENTS (Core Box)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Demmler & Bros., Wm., Kewanee, Ill.
C. M. Smillie & Co., 1100 Woodward Hgts. Blvd., Ferndale, Mich.

VIBRATION REDUCTION PADS
Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

VIBRATORS
Adams Co., Dubuque, Iowa.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Cannon Vibrator Co., 111 Power Ave., Cleveland 14, Ohio.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Nichols Co., Wm. H., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Syntron Company, Homer City, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VIBRATORS (Core Bench)
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

VISES (Air Operated)
Van Products Co., Erie, Pa.

WARM AIR HEATERS
Dravo Corp., Neville Island, Pittsburgh 25, Pa.

WASH ROOM EQUIPMENT
Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WAX (Core, Vent, Pattern)
P.M.S. Co., 1701 Power Ave., Cleveland 14, Ohio.
United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WEDGES (Foundry)
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WELDING GAS
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric Arc)
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.

WELDING and CUTTING APPARATUS and SUPPLIES
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)
National Carbon Co., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

WELDING RODS & ELECTRODES
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

WHEELBARROWS
Construction Machinery Corp., Waterloo, Iowa.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Raybestos Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE BENDERS
Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WIRE BRUSHES
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE CUTTERS
Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WIRE MACHINERY
Economy Tool & Machine Co. Muskegon 23, Mich.

WOODWORKING MACHINERY
Do All Company, Des Plaines, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Oliver Machinery Co., Grand Rapids 2, Mich.
Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23, Ohio.

X-RAY EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

X-RAY FILMS
Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeogh Ave., Milwaukee 14, Wis.

X-RAY INSPECTION SERVICE
Auto Specialties Mfg. Co., St. Joseph, Mich.

ZINC
American Smelting & Refining Co., 120 Broadway, New York 5, N.Y.

—When writing advertisers, please mention THE FOUNDRY—

FOR SALE—EQUIPMENT FROM CLEVELAND PPC FOUNDRY!

Plant Must Be Vacated at Once—No Reasonable Offer Refused

2-ROSS CONV. TYPE CORE OVENS

170′ 1 10′10″ w 7′10″ h. 5″ steel panel insulated walls. Sheet metal longitudinal divisions. Oil and gas fired heaters, Sturtevant blowers, BB motors

ROSS CORE SPRAY DRYING OVEN

147′ 1 8′6″ w 8′6″ h. 3″ thick steel panel insulated walls. 3-section oil and gas fired heaters, Sturtevant blowers, BB motors.

AMER MONORAIL MDI SYSTEM

1350′ track with five MB-8-2 Way Glide motorized switches with two MV-2 Mono Tractor driven cabs ea with 2000# cap. electrolift. Twinhook hoists, 230 V DC

PIVOTED APRON CONVEYOR

24″ wide, RD-60 steel roller chain with motors and reducer

NOSE POURING FURNACES

4—Hausfeld motorized with cast iron pots cap. 2000# of Alum. per heat. Oil burners, motors, etc.

6—Monarch 2000# cap. Nanck burners, micro valves

2—Fisher elec. tilting Alum. furnaces, oil burners, explosion proof motors, etc.

REMELT FURNACES

2 Kellogg 2000# Alum. remelting furnaces, 24″ deep hearth, ea with 4 burners

2-CON'T HEAT TREAT OVENS

Arranged for 2 passes, divided into 4 zones: 1st zone holds 2 carriers 950° F; 2nd holds 3 carriers 950° F; 3rd holds 1 carrier 530° F; 4th maintains work at temp. of 530° F for period of 4 hrs. Conveying system, elec. heating system, circulating system, auto. oper. doors, cooling system, etc.

MISCELLANEOUS

Monorail weighing system
Air hoists
Pouring Station hoods
Melting pot hood & cooling chambers

PIG MOULD CONVEYOR SYSTEM

Link Belt 65′ long. Three 17½ x 6½ x 5″ moulds, ea 24″ section, RC120 steel chain, motors, gear reducers

PHONE OR WIRE FOR INSPECTION APPOINTMENT

HETZ CONSTRUCTION CO. NILES, O., PH. 2-2776

The Best Name in Industrial Reclamation Since 1929

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words, $2.00. Additional words 7c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $4.00. Additional words 12c each.

NOTE—If replies are to be sent to a box number in care of THE FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

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Single Column 2¼″ Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 12.00	$ 11.00	$ 10.00	$ 9.00
2 inches	21.75	20.00	18.25	16.75
3 inches	32.00	29.25	26.75	24.00
4 inches	40.00	36.75	33.25	30.00
5 inches, ½ col.	48.00	44.00	40.00	36.00
6 inches	58.75	53.25	48.00	42.75
7 inches	66.00	60.00	54.00	48.00
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Half Page	130.00	120.00	110.00	100.00
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Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

—THE FOUNDRY—

Penton Building, Cleveland 13, Ohio

Classified Advertising

Help Wanted

METALLURGIST

For a jobbing nonferrous foundry in Maryland. Knowledge of chemical, physical and metallurgical controls of metals needed. Not a routine job but one requiring some foundry experience for eliminating casting defects. Knowledge of sand control would be helpful. Write advising of your experience in detail and salary expected. Interviews will be arranged for at our expense.

BOX 768

THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

For old, established, well-equipped gray iron foundry employing seventy-five, making miscellaneous castings weighing from few pounds to ten tons. Must be capable of producing good product to customer's chemical or physical specifications, to rig jobs, to furnish information for cost estimating, to get production and to maintain good labor relations. A fine position in fine small Michigan city. Submit experience, education, age, salary, etc. Address: Box 759, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT CORE ROOM FOREMAN

Must be capable of assuming full responsibilities of this capacity in organization concentrating principally on heavy duty gasoline and Diesel engine manifolds and other intricate cored work. Plant operating on 54 hour week basis, incentive pay system. Applicant must be energetic, capable of directing and follow through; should be familiar with blower operations. Submit full details of experience, references, salary required and when available. Plant located in attractive city in northern Ohio. Excellent working conditions.

BOX 781

THE FOUNDRY CLEVELAND 13, OHIO

METALLURGIST

For well established foundry in Northern Ohio, producing high grade light and medium weight gray iron castings. Must be capable of taking complete charge of sand control and cupola operations. Only competent and reliable man will be considered. In replying, state age, experience, marital status and salary expected. Replies will be treated confidential.

BOX 788

The FOUNDRY CLEVELAND 13, OHIO

COREROOM SUPERVISOR

One who has successfully organized and operated coreroom employing 150 or more coreroom employees. Must have good knowledge of sand mixes, coremaking and trimming practices, core blowers and assembly of intricate cores for semi-production shop, specializing in automotive, tractor and machine work. Write experience, stressing supervisory experience in coremaking, types of cores you have worked on, references and salary expected. Address: Box 766, The FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

For gray iron foundry, 50 molders, light and medium weight castings. Cope and drag and squeezer machines. Should have ten years' supervisory experience, knowledge of cupola practice, sand control, rigging for production, molding and coreroom. Located in Ohio. State age, experience and salary desired in first letter. Address: Box 790, The FOUNDRY, Cleveland 13, Ohio.

SAND CONTROL MAN

Experienced in sand control for gray iron foundry out of state. Prefer metallurgist who has specialized in sand and quality control. Write in detail experience, references, education and salary requirements. Address: Box 769, The FOUNDRY, Cleveland 13, Ohio.

Help Wanted

ATTENTION!
BRASS, BRONZE, ALUMINUM INGOT SALESMEN AND SALES REPRESENTATIVES

Established manufacturer of highest-quality brass, bronze, and aluminum ingot has openings in all sections of the Middle West for successful sales representatives who are now selling to nonferrous foundries in that territory. Will consider qualified individuals and also established sales organizations handling non-competing products. Liberal commission. Advance for expenses, if needed. Exclusive territory. Not a pioneering project, but a bona fide expansion program, offering those having the requisite experience and ability an opportunity to go into business for themselves on a profitable and permanent basis. Reply in detail, giving experience, record of accomplishment, present requirements, territory interested in, and references. References will not be contacted without permission. All correspondence confidential. Our salesmen know of this advertisement.

BOX 716

THE FOUNDRY CLEVELAND 13, OHIO

BRONZE FOUNDRY FOREMAN

For new modern foundry on art bronze castings, skin dried, dry sand and core assembly molds. Able to train molders and coremakers in the casting of bronze tablets, honor rolls, grave markers and commercial plates and signs. Must have practical background. Position has wide opportunity for advancement.

BOX 783

THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

For grey iron foundry in Northern Ohio. Must be capable of taking complete charge of mechanized foundry employing 40 molders. Must be fully qualified in all phases of foundry practice. State age, experience, education, etc. in first letter. Address: Box 671, The FOUNDRY, Cleveland 13, Ohio.

CUPOLA TENDER

Experienced in grey iron progressive foundry in New York state. Good proposition for qualified man. Submit experience, age, reference and salary desired. Address: Box 760, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT METALLURGIST

For gray iron jobbing foundry located in Middle West. Must have practical experience on cupola operations, sand control and pouring of metal. In answering please state age, qualifications and salary desired. Address: Box 761, The FOUNDRY, Cleveland 13, Ohio.

PATTERN SHOP FOREMAN

Steel foundry in New England area has excellent opening for young, progressive steel foundry pattern shop foreman. Ability to direct construction and rigging of patterns and knowledge of foundry operations required. In replying, give details of experience, salary desired, etc. All replies kept confidential. Address: Box 718, The FOUNDRY, Cleveland 13, Ohio.

REPRESENTATIVES

Who sell direct to foundry trade. Exclusive territory—very good commission. See our advertisement page No. 141. Address: MIDWEST LIGHTING PRODUCTS CO., 1357 BEACH PARKWAY, CLEVELAND 7, OHIO

Help Wanted

CORE ROOM SUPERINTENDENT

Long established and successful company operates two foundries with common core room. Needs man of more than normal ability to administrate and supervise coreroom which employs one hundred persons. Must be 35 to 50 years of age and have basic core making experience. Excellent salary and steady employment. References required. Submit complete experience and recent photograph. All replies will be held in strict confidence.

BOX 784

THE FOUNDRY CLEVELAND 13, OHIO

MALLEABLE FOUNDRY EXECUTIVE

Young man, 25 to 35 years of age, technically educated and trained. Metallurgical and industrial engineering experience important, but administrative ability of prime importance. Ambition, industry and character essential. Position is to start next in authority to production manager of Malleable Iron Foundry (Duplexing). Salary and opportunity will be commensurate with demonstrated ability. Write giving age, education, experience, other facts you feel pertinent and salary requirements to start.
The company soliciting such talent is successful and this step is in line with a program of building for the future an efficient and strong organization.

BOX 767

THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY FOREMAN

With practical knowledge of both core and foundry operation in mechanized production shop. State age, experience and salary desired. Address: Box 709, The FOUNDRY, Cleveland 13, Ohio.

STEEL CASTING SALESMAN

To call on trade in Chicago and surrounding area. Must be experienced in this field for approximately last five years. Salary—good opportunity—replies confidential. Address: Box 674, The FOUNDRY, Cleveland 13, Ohio.

EXCEPTIONAL OPPORTUNITY

For energetic young man with basic technical training in metallurgy, cupola operation, sand control and supervisory experience in grey iron foundry operation. State qualifications, experience and references in letter. Address: Box 776, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Agent familiar with steel castings to solicit in Ohio area. State qualifications. Address: Box 799, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Fully experienced in brass and bronze production, high and low pressure work, must be familiar and have practical experience with all phases of foundry work, cleaning room, core room, foundry job work, semi-production and mechanized foundry setup. Some knowledge of grey iron foundry practice desirable but not essential. State salary and give full particulars regarding age, married or single, previous experience, etc. Canadian applicants only. Address: Box 793, The FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRY FOREMAN

Several openings available for capable, qualified men with experience in supervising operations on molding lines, cleaning room or cupola. This is one of the largest, most progressive grey iron foundries in the country, highly mechanized—high speed production. Ample advancement opportunities and adequate compensation for the right persons. State in reply complete record of past experience, age and salary desired. Address: Box 680, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

INDUSTRIAL ENGINEER

Age 38 years. Presently employed in a large steel foundry and machine shop. College Mechanical Engineering. 16 years' experience in installation and administration of incentive wage plans; also job evaluation. Experience includes handling all types of shop grievances. Good knowledge of foundry and machine shop practices. Especially interested in an opportunity of advancing to a position of greater responsibility. Address: Box 791, The FOUNDRY, Cleveland 13, Ohio.

MANAGER OF FOUNDRY OPERATIONS

42 years old, married, engineering graduate. Over 15 years practical and technical experience in foundries. Ten years in responsible supervisory positions. Looking for change where talents and experience will bring greater opportunities for service. Correspond with interested principals only. Excellent references. Address: Box 740, The FOUNDRY, Cleveland 13, Ohio.

PRACTICAL MOLDER

Twenty years' experience dry and green sand, machine and jobbing. ICS foundryman's diploma. Now employed, age 40, desirous of making connection with well established concern where a man can advance according to his qualifications and abilities. Also A-1 core room man available. Address: Box 777, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SALES REPRESENTATIVE

Experienced foundryman desires connection with foundry producing quality ferrous castings. New York area. Address: Box 703, The FOUNDRY, Cleveland 13, Ohio.

DISTRIBUTORSHIP WANTED

For New England states. Will carry own accounts for jobbers and retailers. Substantial items from manufacturers only. Address: Box 727, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

Mature, competent, practical engineer with an intimate knowledge of the design, installation, operation and maintenance of foundry methods, plant layout, process equipment, patterns, material handling and all types of foundry mechanical equipment incidental to mechanized gray iron production foundries. Address: Box 787, The FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

With approved record in successfully managing and building up foundry, machine and allied industries available shortly for position requiring dependable qualifications and service. Ability to efficiently direct all office, sales, financial and creative activities and produce consistent profits unquestionably established by previous record. Address: Box 775, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY OPERATOR

Experienced manager with a qualified record in production and sales of diversified quality castings, either continuous or conventional operation. Prefer foundry that can make full use of a seasoned and mature background. Address: Box 773, The FOUNDRY, Cleveland 13, Ohio.

SAND CONTROL

Young married man, 10 years' sand control experience in mechanized jobbing foundries. Intensive knowledge of core sands, core sand additions, core oils, synthetic resins, molding sands both natural and synthetic, core blowing system sands, core sand reclamations and foundry practice. Excellent references. Address: Box 779, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM FOUNDRY ENGINEER AND EXECUTIVE

Graduate metallurgist, fourteen years' experience in sand, permanent mold and precision casting of aluminum. Experience includes sand and precision casting of other nonferrous alloys. Record includes technical, metallurgical, supervisory and managerial experience. Would like position with progressive company. Address: Box 774, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT OR ASSISTANT

Over 20 years in foundry work. Age 38. Experienced in semi-steel and alloyed cast iron. Ten years foreman and superintendent. Many years control of foundry sands. Familiar with cupola operation, foundry equipment, methods and costs. Address: Box 762, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Skilled practical foundryman, technically trained with 28 years' broad experience on heavy medium and light castings. Broad background of experience and knowledge in modern scientific controls along with metallurgical background. Well versed with controlling large foundry with all its ramifications. Results produced at once. Address: Box 772, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER

Practical high grade gray iron foundryman, technically trained, graduate metallurgist, 46 years old with very broad background of experience producing quality castings from molder to superintendent of 300 ton a day foundry. Well versed in all departments, both green and dry sand, continuous pouring, processing of iron, sand control, rigging molding machines for high production, cores and cleaning working from blueprints, etc. Want to make new connection with reliable firm needing the services of an outstanding foundryman. Address: Box 771, The FOUNDRY, Cleveland 13, Ohio.

HANDLE FOUNDRY SUPPLIES AND EQUIPMENT

Will handle complete line of foundry supplies and equipment for entire New England states, headquarters Boston, Mass. Consider only the best. Must be substantial. Devote full time. Open office and if substantial, warehouse. Fully experienced ferrous and nonferrous foundryman well established in New England. Welcome complete investigation. Best of references. Address: Box 726, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM PERMANENT MOLD FOUNDRY ENGINEER

TWENTY-FIVE YEARS' EXPERIENCE. COOKING UTENSIL SPECIALIST OR ANYTHING YOU WANT MADE. FULL OR PART TIME. ADDRESS: BOX 667, THE FOUNDRY, CLEVELAND 13, OHIO.

FOUNDRY ENGINEER, METALLURGIST OR ASSISTANT EXECUTIVE

B.S. in M.E. Two years as metallurgist in gray iron and steel. One year as shift foreman in nonferrous smelter, 2½ years as Naval officer. Now foundry engineer in malleable iron. Family man, age 27. What have you to offer? Address: Box 758, The FOUNDRY, Cleveland 13, Ohio.

MASTER MECHANIC AND MAINTENANCE HEAD

Of large foundry and machine shop would like to make change by first of year. Thirteen years' experience, reliable references gladly furnished. Address: Box 723, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-five years' experience as foundry superintendent, practical molder and core maker. Can read blueprints, mix by analysis and understand cupola thoroughly. At present employed. Address: Box 731, The FOUNDRY, Cleveland 13, Ohio.

PRESSURE CAST EXPERT

Will set up and operate anywhere matchplates or castings cast in plaster of paris. Terms—partnership or part owner. Information also given. Address: Box 789, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

EXECUTIVE ENGINEER

Successful experience in putting the foundry on a profitable basis. Desire contact with foundry that wishes to improve its operations. Will consider purchase of stock in the company. Address: Box 797, The FOUNDRY, Cleveland 13, Ohio.

BOX 797
THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY INDUSTRIAL ENGINEER

Experienced in time and motion study work, establishing and installing foundry wage incentive plans, appraisals and cost reduction programs. Several years' employment with consulting engineering firm. Address: Box 732, The FOUNDRY, Cleveland 13, Ohio.

MELTER FOREMAN OR MELTER

Fifteen years' experience both acid and basic. Salary open. Married and good health. Available and references. Address: Box 748, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Practical gray iron foundryman. Twenty-five years' wide experience as superintendent in jobbing foundries making medium and heavy high grade castings. Wants to make moderate investment in small or medium foundry with services as superintendent. Address: Box 795, The FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE ENGINEER

Experienced in administration and operations. Have successfully applied modern engineering techniques for improvements in processing, layout, wage incentives, cost control, marketing, etc. Age 44—married.

BOX 796
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

FOUNDRY FOREMAN

Twenty-one years' molder and foreman in jobbing work, iron, brass and alloys, coremaking and cupola. Will accept molding job with future advancement. West coast preferred. Age 38, married. Address: Box 764, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Young, graduate metallurgist desires position as foundry metallurgist. Age 26, graduate metallurgical engineer. 1½ years' experience as foundry metallurgist as a nonferrous smelter, one year as junior metallurgist with automotive concern and 4 years as squadron engineering officer with air corps. Good technical background. Right man for progressive foundry interested in a young, energetic man. Available immediately. Address: Box 763, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR MANAGER

Practical foundryman—McLain's Graduate—with many years' experience in production supervision of gray iron, semi-steel, brass, bronze and aluminum in jobbing, semi-production and mechanized foundry setups; engaged in sand, centrifugal and precision casting. Presently employed as foundry superintendent-plant engineer. Desire change. Address: Box 756, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER SUPERINTENDENT

Trouble shooter, pattern engineer, gray iron. McLain graduate. Experience in jobbing and production. Desires connection East. Address: Box 704, The FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRY FOREMAN

Wants to make a new connection. Capable, progressive and qualified to direct all foundry operations. Years of practical experience coupled with technical knowledge. Extensive experience in producing light and medium quality castings. Progressive, cost minded and good personality. Address: Box 786, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

PERMANENT MOLD FOUNDRY SUPERINTENDENT

SEVENTEEN YEARS' EXPERIENCE; KNOWS ALL PHASES OF THE BUSINESS PERTAINING TO ALUMINUM CASTINGS. ADDRESS: BOX 664, THE FOUNDRY, CLEVELAND 13, OHIO.

GRAY IRON FOUNDRYMAN

Desires connection in South or Southwest. Twenty years' experience in both shop and office. Technical training. Can assume full responsibility for production, costs, purchasing, accounting or sales. Age 44, married, available on short notice. Address: Box 739, The FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

First class on wood and metal bench, capable of estimating work, layout and make or supervise all work in shop. Capable of taking over shop as foreman, can produce days' work as working foreman in small shop or supervise large shop. 35 years' pattern shop and foundry work on patterns with production work and job patterns. Employed now. Desire change with more responsible job where knowing patterns and how to make patterns is desired. Experience with core blowing, gates and matchplates. Address: Box 782, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOREMAN

Wants position in small or medium size shop. Now foreman in California. Address: Box 800, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

90 PER CENT OF THE CUPOLAS MELT UP TO ONLY 50 TO 60 PER CENT

capacity per hour—although the best and hottest iron is produced only when cupola is operated to its capacity. Report on your cupola may prove an eye-opener—usually the savings are surprising. Every pound of steel used in cupola mixtures reduces cost and increases strength 20 to 60%, because steel is purer than the most expensive pig iron. Watch the scrap pile—statistics prove casting losses can be held between 1 to 5% depending on the line of work. Our system is not an expense—but a valuable investment. Synopsis free.

McLAIN'S SYSTEM INC.
236 E. NORTH AVE.
MILWAUKEE, 12, WIS.

CONTROLLED COMBUSTION FOR CUPOLAS

Melts iron hotter and cleaner with less oxidation. Reduces the melting zone burn out and eliminates bridging, giving a cleaner drop. The melting rate can be increased 25% on large or small heats.

ZIPPLER TUYERE SYSTEM
19302 RIVERWOOD AVE.
ROCKY RIVER 16, OHIO

OPPORTUNITY

Would purchase patterns, drawings and manufacturing rights for 4", 6" and 8" anti-friction bearing, low priced horizontal centrifugal water pumps, belt driven.

STAR MACHINE & FOUNDRY CO.
1209 LINCOLN STREET
AMARILLO, TEXAS

OPPORTUNITY

We can furnish empty tight and slack wooden barrels also steel drums for your products. ADDRESS: BUCKEYE COOPERAGE STATION, C.P.O. BOX 1501, CLEVELAND, OHIO.

Open Capacity

CASTINGS

Grey Iron
10 to 300 lbs.

FISHER & NORRIS
TRENTON, N. J.

OPEN CAPACITY

Foundry in New England has open capacity for malleable castings of all kinds. Quality and prompt service assured. Address: Box 780, The FOUNDRY, Cleveland 13, Ohio.

OPEN CAPACITY

Open capacity in gray iron foundry. Small and medium size castings. Quality and prompt service assured.

BILLARD MACHINE & TOOL CO.
PHONE 44 MANSFIELD, PENNA.

OPEN CAPACITY

Open capacity in grey iron foundry. Waterfronts—burners—bench, pumper and floor work. Address: P.O. Box 321, Belleville, Illinois.

CAPACITY

Company with automatic sand handling foundry for squeezer work desires a connection with user of volume products. Address: Box 792, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON CASTINGS

Open capacity for medium runs on squeezers and rollovers.

BAY CITY FOUNDRY CO.
26th & WEBSTER
BAY CITY, MICHIGAN

PATTERNSHOP

Part interest or take over your present patternshop and run your foundry or job shop as separate department. Twenty-five years' experience with wood metal patterns. First class mechanic on bench and working foreman. Address: Box 689, The FOUNDRY, Cleveland 13, Ohio.

OPEN CAPACITY

Squeezer, jobbing, rollover work in grey iron castings. Quality and prompt service assured. Prefer squeezer assignments from mid-west section near our Kansas plant. Address: Box 339, The FOUNDRY, Cleveland 13, Ohio.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

Wanted-To-Buy

WANTED

One ton electromelt furnace with a 1000 KVA transformer. Address: Box 794, The FOUNDRY, Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

24" or 30" International jolt rollover type G or similar machine. 600# International type JD jolt ram, power pin lift or similar machine. Address: Box 770, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Two A-1 foundrymen, one now employed as general manager and other as superintendent desire purchase of small gray iron foundry or interest therein. Preferably in Massachusetts. Address: Box 778, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Electric magnet 36" or 38"—250 volt DC for unloading scrap and pig iron. Address: Box 29, Ellwood City, Pa.

FLASKS WANTED

Metal slip flasks 12" to 30" round and 17" to 24" square. Please write condition and price on flasks and jackets if any to fit to: LAKESIDE FOUNDRY, WARSAW, IND.

WANTED

One annealing or heat treating furnace. 2,000 degree capacity. Inside dimensions approximately 36" wide by 24" high x 48" deep. Address: CALUMET STEEL CASTINGS CORP., HAMMOND, INDIANA.

WANTED

One 1000 pound electric arc furnace three phase 60 cycle with transformer and controls. Address: Box 706, The FOUNDRY, Cleveland 13, Ohio.

WANTED

1—core oven, drawer type, gas fired, approximately 250,000 BTU. Approximate size—11'3" x 10'8" high. With controls. Address: FALK MILL SUPPLY CO., INC., 18 WARD ST., ROCHESTER, NEW YORK.

WANTED

Detroit rocking furnace 200 to 500 lbs. capacity or induction furnace 100 to 300 lbs. in good condition with transformer and controls. Address: BOX 520, The FOUNDRY, Cleveland 13, Ohio.

Capacity Wanted

CAPACITY

Require squeezer and rollover capacity for up to 100 tons weekly, cores and non-cored castings. Lamp bases, plumbing specialties, loader bases and electrical fittings. Advise full details. Address: Box 765, The FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED PERSONNEL

$3,000—$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

SALARIED POSITIONS
$2,500-$25,000

This thoroughly organized confidential service of 37 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 DUN BLDG. BUFFALO 2, N. Y.

Classified Advertising

Employment Service

JOB RESULTS

Executive, technical, industrial foundry personnel. Your experience record developed into a comprehensive, job winning resume by mail. Write for details: Personnel Counsel Service, 366 Madison Avenue, New York, N. Y.

Foundries for Sale

FACTORY FOR SALE OR RENT

All or part of American Sintering Co.'s plant, Hubbard, Ohio. 14 acres of ground with creek and pumping station.
Machine Shop building with overhead trolley, shaftings and pulleys.
Building with 3 electric transformers, 75 KW each.
Building with 3 storage water tanks, 250 gallons each, and shower room.
Storage and Office Buildings.
Blacksmith Shop and Fire Hydrant Stations.
Over a mile of switching tracks with track scale, steel trestle with bins, made from 26" I Beams.
Inquire:

U. S. METAL CO.
WARREN, OHIO PHONE 23136

GREY IRON FOUNDRY

In Ohio for sale or lease. 24" cupola, 4 squeezers, 1 rollover, 1 pattern draw, core blowers, wheelabrator, 200 ton pig and scrap, monthly pig iron allotment. Address: Box 735, The FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRY FOR SALE

Complete with pattern and machine shop. Going business with 27 years' successful operation. Ideal location in growing industrial section of Texas. Well established demand for product. Price $125,000. Terms. Address: Box 612, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Grey iron jobbing and semi-production foundry now in operation with small connecting aluminum and brass foundry. Located in rapidly expanding industrial Southwest. Materials available and excellent labor and climatic conditions. Equipped with rollover, jolt squeeze machines, muller, wheelabrator and all necessary equipment. Excellent opportunity for future growth. Address: Box 692, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Detroit section, brass foundry, 7000 sq. ft. building fully equipped for production of light aluminum, brass and bronze sand castings. Melting capacity 10,000 lbs. per day. Gas-fired core ovens. Complete assortment of machine molding and flask equipment. Also jobbing equipment. Railroad and yard space. Liberal terms to capable and responsible purchaser. Address: Box 785, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

One sheet metal and steel modern foundry, 22,500 sq. ft. Either equipped or not. Location Oakland, California. Address inquiries to: Room 401, 1706 Broadway, Oakland, California.

For Sale

FOR SALE

Whiting hydro-clone spark suppressor for #4 Whiting cupola. Has been kept painted and never beer used. Will sacrifice for $1250.00. cost new $2500.00.

NUTMEG CRUCIBLE STEEL CO.
BRANFORD, CONN.

For Sale

GOOD USED EQUIPMENT

Sly Dust Collecting System, consisting of 3 Sly #62 Dust Filters to handle 15,000 CFM each. Motors 220/440 volt, 3 ph. 60 cycle, erected but not used.

10-ton Northern, 50' Span Bridge Crane, 3 motor, cab controlled, 230 volt DC.

Hassel Direct Safety Foundry Swing Grinder, Motor 230 volts DC.

Hisey-Wolf, double end Foundry Snagging Grinder, Motor 230 volts DC.

10 HP, P&H Ball Bearing Crane Motor, 230 volts, 675 RPM.

60 HP, Westinghouse Type SK, Compound Wound Motor, 230 volts DC, 680 RPM.

IRA C. JORDAN,
2508 EAST BELLEVIEW PLACE,
MILWAUKEE 11, WISCONSIN

FOR SALE
USED FURNACE EQUIPMENT

ANNEALING FURNACE, Mfg. by Holcroft & Co. Pusher type; 2-conveyers, Size 18' x 11' x 13'. New cost $12,297.00.
CARBURIZING FURNACE. Mfg. Gen. Elec. Co., Elec. Vertical cylinder, Door opening 18" W x 3' H. Overall size 6' x 9' H. Wgt. 12000#, Temp 1800° with equip. New cost $6,840.00.
ELECTRIC AGEING OVER, Mfg. R. C. Mahon Co. Heat zone dim: 4' x 6' x 7', Overall size 11' L x 7' W x 8' H, Temp. 450°, other equip: Buffalo fan, foxboro recorder, (2) G/E/MAG/SW, Control panel. New cost $4,980.00.
FORGE FURNACE Mfg. Industrial Heating & Equip. Co., Std. Size 13½" Deep x 72" wide. Cost new $1110.00.
HARDENING FURNACE. Mfg. Lithium Corp., std, Model HDU-1836-9, Size 6' L x 18" W x 12" H, temp. 1800°. New cost $7,663.50.
The above equipment in very good condition. Must move at once. Will sacrifice at fraction of original cost.

T. T. MUSSELMAN
1114 WASHINGTON BOULEVARD
DETROIT 31, MICHIGAN
TEL. TY 4-3480

FOR SALE

1—Hydro-Whirl (Grinding dust collector)
2—Lindberg magnesium tempering and heat treating furnaces. K.W. 66, volts 440, phase 3, Type 4348 EL Max. Temp. 850° F. (Slighly Used)
1—Micromax (temperature indicator for metals) manufactured by Leeds & Northrup Co.

AMERICAN FOUNDRY
P.O. BOX 226
LOS ANGELES, CALIF.

FOR SALE

One #8 American rapid Stock Core Machine complete with motor. Starter and switch—Including dies, screws, and trays.
Two D-5310 Ruemelin Welding Fume Exhaustors, Complete.
Three 1-Ton Single I Beam Cranes—with underslung 4-wheel trucks—without hoists.
One Jaeger portable 2" Water Pump with Gas Engine.
One 12" L. J. S. International Post Jolt Squeezer Molding Machine.
One Climax Rod Straightener with Motor.
One Ball Plate 40 x 40 with 1½ Balls (Used for turntable).
One Boston Gear Reducer complete with motor. Ratio 48 to 1—output 36 R P M—Type A—Mount. Motor 1/3 H. P.—3/60 /440 .6 amp Type K.

CALUMET STEEL CASTING CORP.
1636 SUMMER ST. HAMMOND, INDIANA

FOR SALE

427' Mathew's roller conveyors. 12 curved sections 30 straight sections. Also Cleveland speedaire reducer ratio 18½ to 1. Address: G. W. VANDERVORT COMPANY, P. O. BOX 580, PORTSMOUTH, OHIO.

For Sale

FOR SALE

1—Eclipse Oven with Brown Program Control for annealing and heat treating, inside dimension of furnace 48" wide x 24" high x 48" deep, equipped for gas firing, built in August 1946, catalog No. 4848-24.
1—Trent Electric Furnace with Brown Instruments, 3½ KW, 175 volts, 1 phase, 60 cycle, size MLR 4A, #60861.
5—Fisher 22" Tilting Furnace, take #275 crucible, equipped for gas firing.
1—Tilting Furnace, take #400 crucible, equipped for gas firing.
1—Eclipse Crucible Type Brass Melting Furnace, gas fired, catalog #200S.
1—American Electric Furnace, catalog #P1, KW 8.3, Amps. 118, volts 70, cycle 60, phase 1, serial #5703.
1—Pallet Conveyor, Jeffrey No. 24, 360 ft. of track, motors, 59 cars, elevation above floor 24", cars are spaced 72½", car tops are 48" wide x 60" long of ⅝" steel, hydraulic rams pushes molds off conveyor to shake-out.
1—Centrifugal Casting Machine and Motor, Centri-meco made, model SR-PR, serial No. 174.
1—Royer Shakeout Machine with Motor, 64" long x 52" wide, table 29" x 58".
1—Constant Heating Tank with motor and pump, with thermo controls.
1—Waage Air Pressure Wax Machine.
2—Osborn Rollover #203, take plates 36" x 50" with 8" draw, air clamps and air controlled table.
2—Osborn Jolt Rollover machines #601-13.

OLD COLONY FOUNDRY COMPANY
EAST BRIDGEWATER, MASS.

FOR SALE

1—Simplex, #94—Oil-Fired Furnace and Blower
1—Fisher, Type S 4-Burner Gas-Fired Furnace, $400.00 (NEW)
500 Transite Core Plates, 30" x 6" priced at $1.25 each
1—Sand Blast Room (Pangborn) 13' x 13' x 10', complete with Pangborn Dust Collecting System, perfect condition, Priced at $2.000.00
1—Osborn #401 Rollover molding machine with leveling device.
Plus, a complete line of Conveyors, air compressors, and scales in stock at all times.
Send us your inquiries!

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 E. BROAD STREET
SHILLINGTON, READING, PA.

EQUIPMENT FOR SALE

1 Leeds and Northrup Micromax Electric Pyrometer complete
2 Model "H" International Jolt Squeeze Molding Machines
1 20" Diamond Double end Disc Grinder—plain bearings—swinging table—belt driven.
1 Bench Type Randoll Core Blowing Machine—used only two weeks—complete with 6 blow plates.
1 Combination Royer Shake Out Machine and Sand Conveyor Model ST-545.

HUNTER FOUNDRY CO.
8524 SOUTH VINCENNES AVE.
CHICAGO, ILL.

FOR SALE

3—Robertson 36" dia. galvanized steel ventilators, complete with tops, flat dampers, bases, fans and motor collar units, motors totally enclosed ball-bearing for vertical operation, 1½ H.P., 1150 rpm, 440 volt, 3 phase 60 cycle, with 30" dia. aluminum fan blades. Also includes Barber Colman damper motors for operation of the flat damper. Address: FITCHBURG FOUNDRY DIVISION, KINGSBURY MACHINE TOOL CORP., BENSON STREET, FITCHBURG, MASS.

FOR SALE

1—Whiting #9½ Model B Cupola section E 45' with Tuyeres. Self segments, arranged for 9" thick lower lining. C.I. charging door frame wishbone and grapple.
1—3 Ton capacity Horseshoe charging trolley 11' span 34' lift equipped with GE 3 HP and 15 HP traction and lift slip ring motor 3-60-220 60 FPM drum controllers, resistance grids, including switches, trolley system, etc.

BOX 523
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

6" type 275 J Osborn jolt squeeze molding machines like new. Address: Washington-Fillmore Foundry, Inc., Buffalo, N. Y.

Classified Advertising

For Sale

FOR SALE

Robbins #J11 portable shakeout 72" x 120", 34000# capacity, 220/440 volt, 3 phase, 60 cycle totally enclosed ball bearing fan cooled motor. Shakeout used approximately 2 weeks. Address: FITCHBURG FOUNDRY DIVISION, KINGSBURY MACHINE TOOL CORP., BENSON STREET, FITCHBURG, MASS.

FOR SALE

Two (2) #BBI #125 gas-fired hand-tilt Fisher furnaces complete with silicon carbide lining, multiple burners and proportional mixer. These furnaces have never been used. A good buy.

THE SAVILL COMPANY
N.E. COR. HANCOCK & HUNTINGDON STS.
PHILADELPHIA 33, PA.
PHONE: RE: 9-1406

FOR SALE

One used Elwell Parker low lift platform type truck; 6000 lb. capacity.

Two Edison batteries C-10 24 cells each.

BUNTING BRASS & BRONZE CO.
TOLEDO 9, OHIO

FOR SALE

1—Heavy duty Link Belt herringbone speed reducer—size D-18, 53 to one ratio. Approximately 100 H.P. with 1200 input speed. New unit, never used.

2—Stedman type A 20" x 18" rolling ring crushers. Suitable for use in foundries for core crushing. Capacity 18 tons per hour.

BOX 798
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

1—Whiting #8 Cupola
1—Paxson Cupola
1—Pangborn Sand Blast Room
1—Pangborn Dust Collector and Classifier
Also quantity of Cleveland Tramrail track and switches.

BUFFALO SCALE COMPANY, INC.
BUFFALO 13, N. Y.

FOR SALE

STEEL BUILDING
160' x 274'—38' high
Complete with runway in each of 3 bays.
Condition: Good.

IRON & STEEL PRODUCTS, INC.
13444 S. BRAINARD AVE.,
CHICAGO 33, ILLINOIS.
"ANYTHING CONTAINING IRON OR STEEL"

FOR SALE

1 only—symbol FX355 Ingersoll-Rand cupola blower, serial No. 3-355-G10-rated 4600 CFM, 1-0 MPR, 30 HP, 40 degree, 3500 RPM-200 V, 3 phase, 60 cycle, standard open motor, autoconstant air weight control mechanism, including current transformers and starting compensators. Subject to prior sale. Price—$1750.00 f.o.b. Fairfield, Iowa. Address: THE DEXTER CO., FAIRFIELD, IOWA.

FOR SALE

1—#3½ cupola complete, like new, one year old. Call or write: NYLEN PRODUCTS COMPANY, ST. JOSEPH, MICHIGAN.

LADLES FOR SALE

Two 51" top diameter, 9,000 pound capacity Whiting bottom pour crane ladles, square bale, lined ready for use. Immediate delivery. Price $500.00 each, FOB: COLUMBIA TOOL STEEL COMPANY, CHICAGO HEIGHTS, ILLINOIS.

FOR SALE

Six model C-414 Grimes hand rammed rollover molding machine. Address: Box 745, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

1 W-Green positive pressure blower 420 c.f.m. @ 3½ lbs. complete with motor.

1 Buffalo circulating blower.

1 Sturtevant cupola blower, 7" dual pulleys

1 Mumford squeezer 15" cy.

1 Federal post-type rapid squeezer 7½" cy.

1 Norton pedestal-type floor grinder, belt dr.

1 50 H.P. slip-ring motor, 220 V., 900 R.P.M.

EDWARD A. MEYER
GREEN BAY, WISCONSIN

FOR SALE

FOUNDRY EQUIPMENT AVAILABLE FOR IMMEDIATE DELIVERY, SUBJECT TO PRIOR SALE, F.O.B. MANSFIELD, PA.

#9 Model B Whiting Cupola, late model	$2500.00
Schutte & Koerting tumbling barrels, 24" deep x 28" wide, bronze lined. Motor drive, push button controls	450.00
Portable conveyor, 30' x 18", 5 HP 220/440/60/3 motor, 42" wheels	550.00
27" x 36" American Wheelabrator tumblast, model BM-65325, with 5 motor 220/440/60/3, #9 CL Clarage Exhauster, blast gates, #65 Dust Tube Collector	4250.00
Roller conveyor, ball bearing, almost new. Random lengths—8 to 10 ft.—Per ft.	2.80
Buffalo MX Blower, flat belt drive, not motorized	55.00
20" x 22" International portable jolt strip molding machine	250.00

BILLARD MACHINE & TOOL CO.
MANSFIELD, PA.

FOR SALE

1—International Molding machine, size 43" x 55" x 16" draw, type F, serial No. 49168-1 used four months.

MARYLAND CAR WHEEL COMPANY
BOX 1604
BALTIMORE 3, MARYLAND

FOR SALE

We have the following all steel flasks, with pins and guides like new for immediate sale:

100 sets 16" x 16" x 4"
30 sets 12" x 22" x 5"
40 sets 12" x 18" x 4"
40 sets 15" x 15" x 4"
40 sets 10" x 16" x 4"
100 sets 24" x 26" x 6"

WASHINGTON-FILLMORE FOUNDRY INC.
BUFFALO, N. Y.

FOR SALE

Stroman #400 NP tilting type oil fired brass furnace, complete with blower and 4 crucibles. This machine is practically new.

Also

Hundreds of steel bands, assorted sizes, for snap flasks, 90% of which have never been used. 12½ cents each. Send us list of your requirements.

TURNER MANUFACTURING CO.
STATESVILLE, NORTH CAROLINA

FOR SALE

2—#0 Johnston & Jennings, Jolt Squeezer Draw Pattern, 15" x 21" table.
American Foundry & Equipment Co. Model "AA" sand cutter. Size 86-51 or 96-61.
2—SPO Hand Rollover, Power Draw Moulding Machines complete with run-out cars. Size—22½" x 60".
Gas & Electric, Hardening Furnaces, all sizes.
Eclipse, High Pressure Blowers, all sizes—48,000 cu.ft.p.hr.
Eclipse High Pressure Blowers, 18,000 cu.ft.p.hr.
North American Blowers, High Pressure, 950 cu. ft.p.m.
Eclipse, High Pressure Blower, 100,000 cu.ft.p.hr.

FALK MILL SUPPLY CO. INC.
18 WARD ST. MAIN-6347
ROCHESTER, NEW YORK

For Sale

FOR SALE

Three skillet molds, sizes 7", 10" and 12". These have been in production and are ready to run. To move these from our inventory we will sell all three for six hundred dollars F.O.B. Address: FLORIDA ALUMINUM CASTING FOUNDRY, INC., P. O. BOX 9014, WEST PALM BEACH, FLORIDA.

FOR SALE

STEEL FABRICATING BUILDING
150' x 580'—80' high
Complete with two, 10 ton O.H. Cranes and Runways in two bays.
Corrugated roofing and siding, steel sash. All in excellent condition.

IRON & STEEL PRODUCTS, INC.
13444 S. BRAINARD AVE.,
CHICAGO 33, ILLINOIS.
"ANYTHING CONTAINING IRON OR STEEL"

FOR SALE

Two 500# capacity double rated Linde acetylene generators. Condition like new. Address: L. J. Mueller Furnace Co., Milwaukee 7, Wis.

OVERHEAD ELECTRIC TRAVELING CRANES

QU	TONS	MAKE	SPAN	CURRENT
2	3	Shepard	18'0"	230-VDC
1	5•	Northern	14'0"	230-VDC
1	5•	Shaw Box	30'0"	230-VAC
1	5•	Northern	37'0"	230-VDC
1	25/5	Niles	80'0"	230-VDC

•LOWHEAD ROOM TYPE.

MONORAIL ELECTRIC HOISTS

QU	TONS	MAKE	CURRENT
2	¼	LoHed	230-VDC
6	½	Shepard	230-VDC
1	1	Shaw Box	220-VAC
1	1	Wright	118-VDC
1	1	Box	230-VDC
1	3	Shepard	230-VDC
1	3•	Shepard	230-VDC
3	3•	LoHed	230-VDC
3	5•	LoHed	230-VDC

•2 motor FL. Op. Hoists we can supply them with cages.
3—¼ ton Yale stationary mounted hoists, 120-VDC, wrap 77' of ⅛" cable, 85-FPM., with 3-HP. motor (will furnish these arranged for 230-VDC)
ALL ABOVE IN STOCK OFFERED REBUILT & GUARANTEED.
SEND FOR OUR STOCK LIST OF A.C. & D.C. GENERAL PURPOSE CRANE & MILL MOTORS, ELECTRIC BRAKES & CONTROL EQUIPMENT, MOTOR GENERATOR SETS, TRANSFORMERS, ETC., OF ALL SIZES.

T. B. MACCABE COMPANY
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PHILADELPHIA (40), PENNA.

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2100 cfm @ 10 oz. Spencer, with 10 HP, 220/440 V. 3/60/3600 RPM motor.
(4) 675 cfm @ 6 oz., Spencer, driven by 2 HP, 220/440 V., 3 ph. 60 cycle 3600 RPM.

ALSO MANY PRESSURE BLOWERS
NOT LISTED
HOISTS

¼ Ton—Detroit Titan—440/3/60
¼ Ton—Budgit—220/3/60
¼ Ton—Comet—440/3/60
¼ Ton—P & H—440/3/60
½ Ton—Chisholm Moore—440/3/60
½ Ton—Cleveland—440/3/60
2 Ton—Lo-Hed—220/3/60

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND 14, OHIO

FOR SALE

New heavy duty motorized rod cutter, 65 cuts per minute; capacity: ⅝ inch round hot rolled steel. Brand new. $890.00 f.o.b. Cleveland. Address: The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Classified Advertising

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FOR SALE
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1—4½ x 4½ with motor and tank
1—Ingersoll Rand No. 63832, Class E.R.-2 air cylinder 7 x 3½ x 5.

BURNERS
5—gas burners

CORE OVENS, New
1—half round with 5 shelves 51" high, 54" wide, 27" deep
We also manufacture core ovens, any style or type desired—shelf, pullout drawer or car type.

FURNACES
3—Fisher brass and aluminum furnaces Type S, complete with burner, new motor and blower.

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1—International J.D.P., power jolt, power lift.
2—International hand operated rollover machines, table 17 x 22

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1—8 ton worm geared
1—5000 worm geared

We make new ladles.

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2—Blystone mixers
1—4 ft. Lancaster mixer complete with loading bucket.

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1—560 pin lift
1—J276 pin lift
1—JW275 pin lift
} These are all Osborn squeezers

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2—Milwaukee rebuilt jolt squeezers
1—Rapid, portable jolt squeezers, new—only used 2 weeks.

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40 Sets—12 x 31—10 cope and 10 drag.....Price per Set $14.00
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30 Sets—12 x 31—7 cope and 7 drag.....Price per Set 16.00
30 Sets—18 x 19—4½ cope and 4½ drag.....Price per Set 11.00
40 Sets—18 Round—4 cope and 3 drag.....Price per Set 7.00
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2 Sets—22" Round—4 cope and 6 drag.....Price per Set 10.00

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20" Electric riddle bottoms
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2—#4 tilting type

SAND BLAST CABINETS
1—type K 48" x 48" x 42" with dust arrestor, practically new

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1—42 x 70 tumbling mill, 15 HP. Motor, clutch driven.

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3—Barrel trucks, 2 wheel, rubber tires
Pneumatic tires, 600# capacity
Core trucks, 27 x 60 platform
1—Automatic lift truck and charger
Lyon-Raymond Hyd. lift truck
2500# Cap. model CW-11-54
Air Bench Rammers
Air Floor Rammers
Air Grinders, Portable
Chipping Hammers
Vibrators
Branford Shakeout Vibrators
Assortment of New Emery Wheels
1—Scleroscope
High Speed Motors & Blowers for Brass Furnaces, several different sizes.
2000 Ft. of new ⅜" Air Hose
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80 ft. of 19" wide, 1¾" dia. rolls, 4" centers.
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1 NEW 210,000 GAL. CAP. VERTICAL

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450 NEW 4200 GAL. CAP. VERTICAL

4 NEW 20,000 GAL. CAP. HORIZONTAL

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Tum-blast, size 27 x 36
American—Late Model

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TEL. HENDERSON 1765

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1—1¼ yard Hayward motorized bucket. Approximately 9' high overhauled and in good condition. Address: LUFKIN FOUNDRY & MACHINE CO., LUFKIN, TEXAS.

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1—American Wheelabrator 27" x 36" with 10 H.P. Westinghouse Motor, complete with American Dust Collector 75 size, containing 10 H.P. Westinghouse Exhaust Fan and Motor, ¾ H.P. Motor in Dust Hopper.

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Clearfield Muller
Model
610
Will sacrifice

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TEL. 4-5394

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Complete Bartlett & Snow sand sand system, nearly new, capacity 25 tons per hour, 12 molders' hoppers, automatic plows. Also core sand system with weighing hopper. Four Koch core ovens. To be sold by owner to clear plant for other purposes.

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For Sale

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2—SPO #611-B stationary oscillating squeeze strippers.
1—SPO #4½ JHS air jolt hand strip.
2—Tabor Plain Squeeze, Strain Rod Type.
3—Mumford 3" Cyl. Core Jolt, with 20" x 15" Table.
1—Tabor combination jar rollover pattern draw, 40" x 50" table, 21" draw. Capacity 2000 lbs.

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6—#805 General Blowers, 5 H.P., 3/60/220, 1400 C.F.M. at 8-oz. pressure.
Maxon-Premix Blowers for Gas, ¼ to 1 H.P.

METAL MELTING EQUIPMENT
1—Style #600 Single Burner Tilting #150 Crucible Furnace for Gas, complete with lining and #7 Blower and motor—220 Volt.
2—Hausfeld 1000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired.
2—Hausfeld 2000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired.
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2—Hausfeld Open Flame Tilting Brass Furnaces, 400# capacity, Gas or Oil.
3—Stationary Gas Fired #60 Crucible Furnaces, with ¼ H.P. Maxon-Premix Blowers.
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New 32" to 41" Dia. Shell Cupolas made to order.

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4—New Haven 36" x 46" Self Contained Sand Blast Barrels, Belt Drive.
2—Pangborn Syphon Feed Sand Blast Cabinets.
3—Portable Sand Blast Generator Tanks, 500# Sand Cap.

MISCELLANEOUS
1—A-No. 1 Blystone Sand Mixer 3 cu. ft., with motor connected.
1—(New) Type "D" #14 Roto-Clone Dust Collecting System, complete with Booth, Blower, 7½ H.P. Motor, Collecting Hopper and After Cleaner.
1—Model "M" Beardsley Piper Screenerator, 3 H.P., 220 Volt, 3 phase, on Rubber Tires.
1—Heavy Duty Back Geared Sprue Cutter, 1½" square knives, T. & L. pulley drive.
1—No. 1 Blystone Sand Mixer, 7 cu. ft., 5 H.P. 3/60/220-440, motor connected.
6—Worm Geared Tilting Ingot Mold Stands, 6' to 12' long.

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1023 W. SIXTH ST.
CINCINNATI 3, OHIO
PHONE PARKWAY 7812

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American WHEELABRATOR with 66" swing table, complete with electrical equipment and timer. American No. 85 Dust Tube Collector included. This machine only two years old.
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1 BINKS SPRAY BOOTH NO DEF-8 complete with exhaust fan, tank etc. Top Exhaust. 8' wide, 7' high, 4'6" work depth, overall depth 6'11".
1 DRIES AND KRUMP SHEAR No. 272, capacity 14 gage—72". Complete with motor and 2 extra blades.
6 MASTER AIR RAMMERS, M300 Models, less than one year old.
1 ILG EXHAUST FAN No. P30 with 4 H.P. Motor.
1 DEWALT RADIAL SAW Model GER complete with 5 H.P. Motor and two 7' roller tables, less than a year old.

PREMIER FURNACE COMPANY
DOWAGIAC, MICHIGAN

FOR SALE

1—Sly centiblast 8'0" rotary table
1—Sly #00 tilted barrel type blast mill.

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153 FILLMORE AVE. BUFFALO, N. Y.

Order "Industrial"
Get Prompt Delivery!

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STEEL FLASKS & SLIP JACKETS

FOUNDRY EQUIPMENT BUILT STRONGER TO LAST LONGER

● An all-welded steel flask designed for production and long life. Fabricated from quality materials to your specifications. Sand strips top and bottom with parting line surface ground for accurate fit.

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● All sizes and modifications of above construction available. Let "Industrial" engineers help solve your problems of unique conditions, special shapes and sizes.

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HOME OFFICE AND FACTORY

INDUSTRIAL FABRICATING, Inc.

TELEPHONE 6781

817 HALL STREET EATON RAPIDS, MICHIGAN

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61.6% OF ALL SHAKE-OUTS IN U. S. FOUNDRIES ARE SIMPLICITYS!

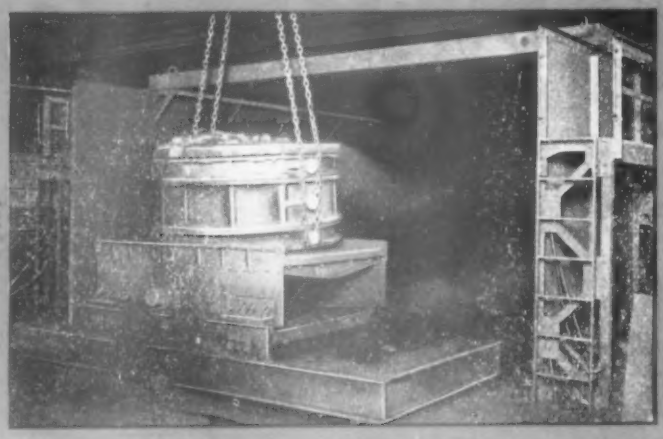
Simplicity shake-out units now in operation in U. S. foundries outnumber all other makes and types combined. Facts prove it!

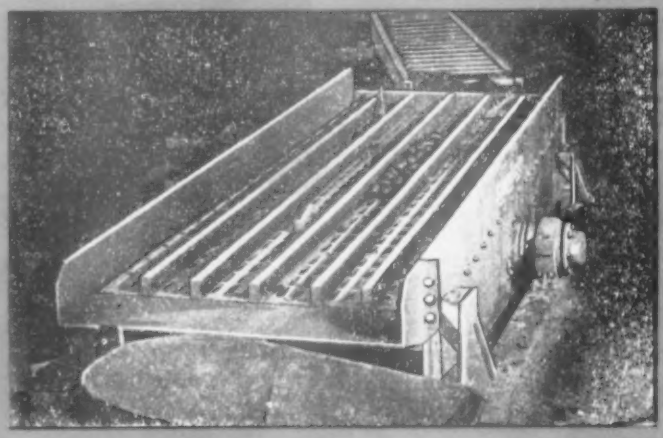
Fact #1. A recent survey made by FOUNDRY magazine show there are 2,708 shake-out units of every description and all ages installed in foundries throughout the country.

Fact #2. Since entering the foundry equipment field in 1933, Simplicity has designed, built, sold, and installed 1,670 shake-out units.

Fact #3. Simple arithmetic shows the great preference for Simplicity equipment—**61.6%!**

The reasons for Simplicity shake-out leadership are simple. The Simplicity special solid counterbalancing shaft produces irresistible vibration. Castings are separated from flasks swiftly, cleanly, easily. Shake-out time, labor, and costs are slashed to absolute minimum. Massive construction practically eliminates maintenance and repair, efficient design conserves floor space. Simplicity Shake-out Units are available in standard sizes for permanent or portable installation with capacities from 500 to 100,000 lbs.; special sizes to order. Send us your shake-out problems for suggestions without obligation, and ask for your copy of the complete Simplicity Foundry Equipment catalog.





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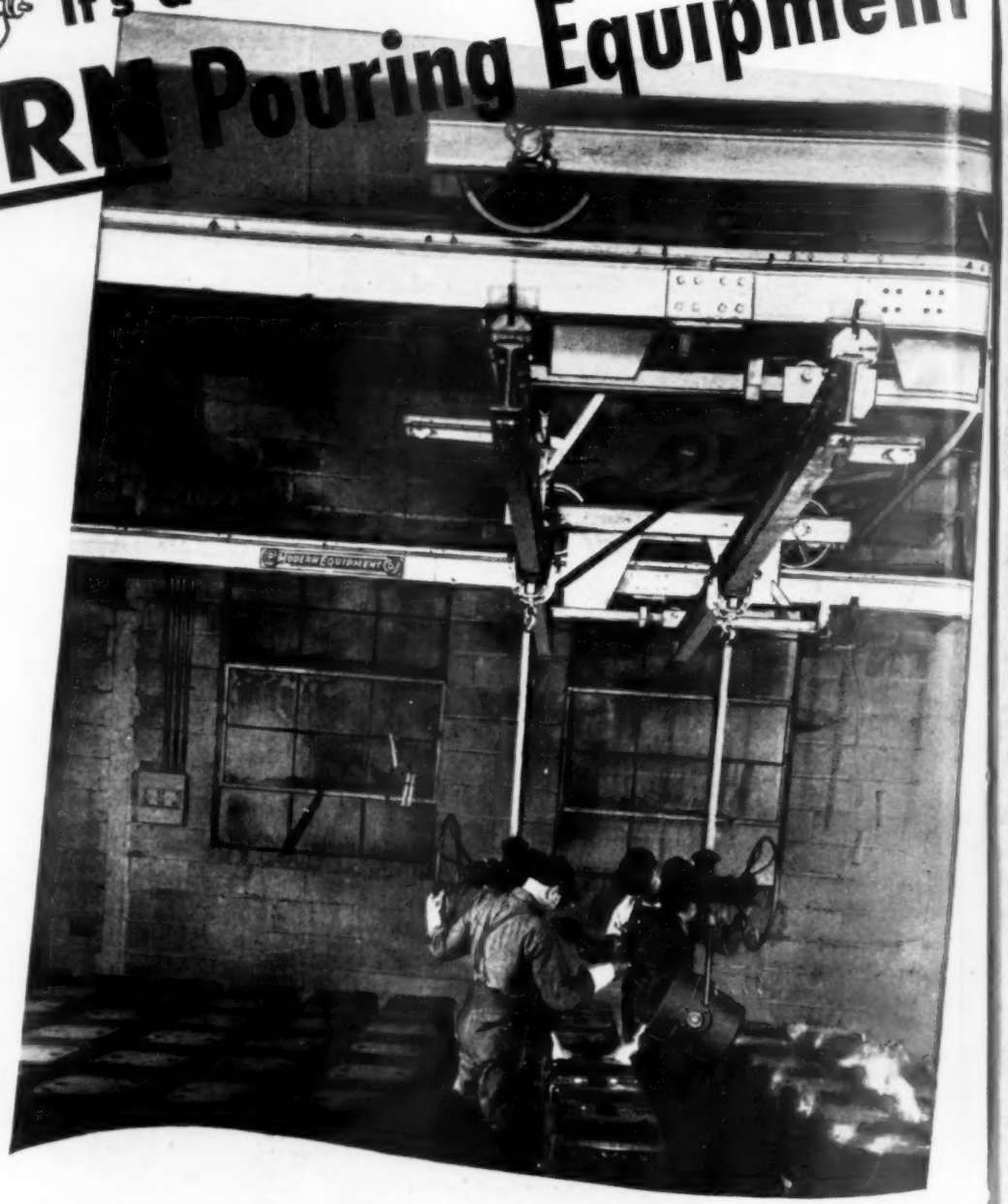
- FOR EXPORT: BROWN & SITES, 50 CHURCH ST., NEW YORK 7

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY, DURAND, MICHIGAN

TWO-UP Pouring?

It's a cinch with MODERN Pouring Equipment



For a convincing example, look at the installation pictured. It shows two MODERN Pouring Devices and Ladles suspended from a special MODERN Double Beam Crane which interlocks with a MODERN Monorail System. "Two-Up Pouring" is made a simple, efficient, time and labor saving operation . . . which assures high quality production.

Yes, you can count on the MODERN EQUIPMENT CO. engineering staff for dependable counsel on all of your pouring problems. As pioneers and originators of mechanized metal-pouring systems, pouring devices and ladles, they are responsible for the major advancements in this phase of foundry operation.

WRITE Dept. F for Bulletins 142 and 143-A

. . . or ASK your MODERN Representative

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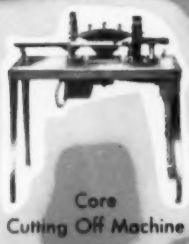
Natural Draft Furnace

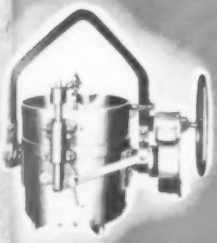
Gyratory Riddle

Core Blower

Core
Cutting Off Machine

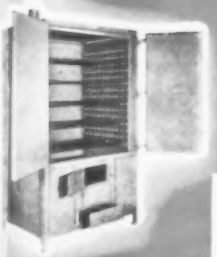


Geared Ladle

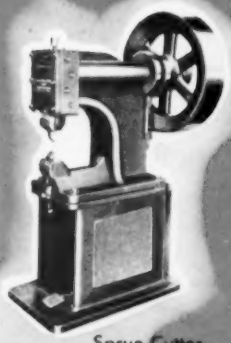


Grinder

Stevens Core Oven



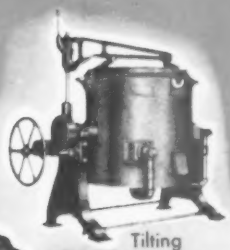
Sprue Cutter



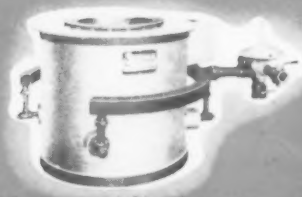
Sand Mixer

Sand Stove

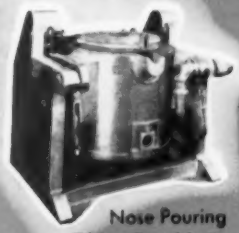
Tilting
Crucible Furnace



Stationary Melting Furnace



Nose Pouring
Tilting Crucible Furnace



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